INDEX NUMBER

Vol. XIV DECEMBER, 1928 No. 12

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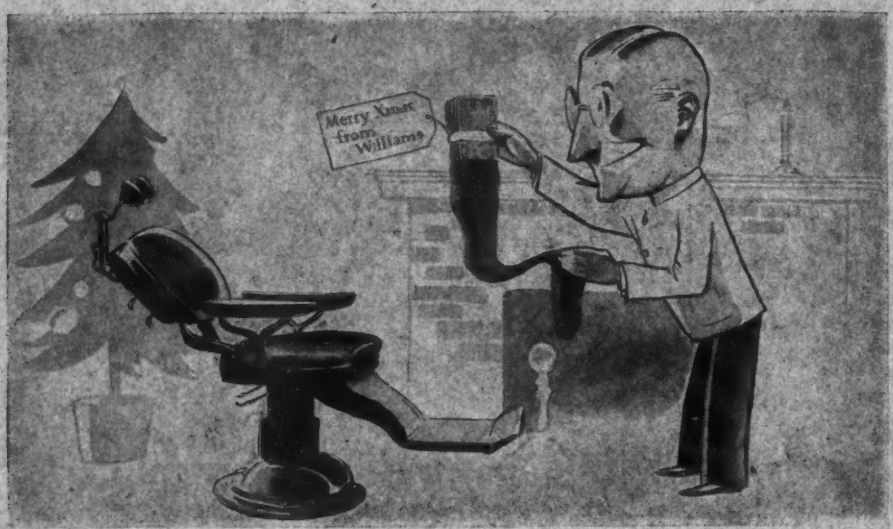

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VOL. XIV ST. LOUIS, DECEMBER, 1928 NO. 12

ORIGINAL ARTICLES

CAST OVERLAY TECHNIC AND ITS APPLICATION IN PRACTICE*

BY R. C. WILLETT, D.M.D., PEORIA, ILLINOIS

IN FEW of the scientific professions has such rapid progress been made as in that of dentistry, considered in all of its branches. Its past and present attainments are many and great; its future ones unguessable, but—there remains with us that deterrent factor, more or less present in all scientific achievement, namely, the temptation to adhere too closely to "as it was in the beginning, is now, and ever shall be" formulas of belief and practice, through fear of the fire of opposition almost sure to be invited by any radical departure from comparatively efficient, established methods.

With this fact in mind, the presentation of the cast overlay technic, and its application in practice, have been deferred by the writer until now, when, through several years its value has been thoroughly tested, and its advantages proved.

Regardless of the method of attachment employed, it will be readily conceded that the success of a fixed orthodontic appliance depends upon the security of its anchorage. Since the introduction of a certain type of molar anchor band by Fauchard, in 1723, many modifications and improvements upon it have come into general use, but the discerning operator is aware of the fact that many undesirable features are attached to its employment in practice.

PROFESSIONAL OBLIGATIONS

Our first professional duty is to be humane, and to accomplish all service connected with orthodontic procedures with a minimum of pain and discomfort to the patient, but in the many and invaluable books and treatises on orthodontic technic, there are few references to the desirability of the amelio-

*Read before the American Society of Orthodontists, Buffalo, N. Y., April 30-May 3, 1928.

ration of suffering to the patient which may be involved in the adjustment of bands for either corrective or postmaintenance purposes.

Our second obligation is to conserve the time spent in the procedures, and by doing this to lessen the nerve strain on the patient and the operator, to a degree consistent with thorough treatment.

Our third, and it would seem our most important consideration, is to avoid the attachment to teeth of appliances that may cause either temporary or permanent injury to hard or soft tissues of the mouth. At all times an orthodontic treatment appliance is a menace, and this is due to the fact that it is foreign to a normal condition of the mouth, and therefore must be regarded as the lesser of two evils: one, the deformity to be corrected, the other, the appliance and method of correction. The danger lies in the possibility that the appliance or some of its parts may become the greater evil of the two.

FAULTS OF THE MOLAR ANCHOR BAND COMMONLY USED

The outstanding faults in the making and adapting to use of the type of anchor bands in general use today are:

1. The annoyance caused the patient by the separation of teeth, a process generally necessary for the proper fitting and setting of a molar band whether the band is constructed by direct or indirect method.
2. The displacement of teeth, caused by the thickness of the metal band between them, this displacement leaving broken contact when the appliances are removed.
3. The frequent irritation of the interproximal tissues.
4. Injury to the investing tissues of the teeth, in the event of a broken band, or a loss of cement attachment to the tooth, permitting the band to be crowded over the neck of the tooth and into the gingival tissues. A certain result of such inefficient appliance would be tissue injury and great discomfort to the patient.

HISTORY

During the past ten years, the writer has endeavored to perfect a means of fixed anchorage more desirable in its utility and its comfort than the plain anchor band now in common use. The effort has resulted in the making and the practical demonstration of an overlay, designed to overcome previously stated objections to the use of the common anchor band, and to supply a base of attachment superior in strength and security to that in general use today.

Due credit is here given to Dr. J. Lowe Young for coining the term "overlay," which in 1920 was first used by him, and applied to a technic of his own that furnished germinal ideas, through which was evolved much of the technic here presented.

The first cast hard gold overlays which I successfully made and applied were used as a part of fixation appliances in the treatment of jaw fractures. In April, 1924, the overlay was first used in the making of space maintainers for application where a premature loss of one or more deciduous molars had occurred. The object of such an appliance was to bridge the space with a

semifixed bar, thus restoring function in the affected area, and preventing occlusal displacement of teeth of the opposing arch. Due to occlusal stress on such appliances, they had proved to be more or less failures when the anchor band had been used in their construction, but the overlay used on the anchor teeth solved the problem.

It was found that the overlay, when used in such appliances, rarely became free of cement attachment, and that when it did, the investing tissues were not injured as they are liable to be when a band used in such service becomes free of cement attachment.

The success of overlays in the construction of space maintainers was followed by their use in orthodontic appliances of the Mershon lingual spring wire type, where a general expansion of the mandibular deciduous arch was indicated, and where such expansion would be favorably reflected in development of the maxillary arch to a more normal width, through the forces of occlusion.

Because of the satisfactory results obtained by use of the overlay in such cases, it was next used on the maxillary deciduous molars, as a base of anchorage for lingual wires.

It was not long before we were using the overlay on permanent molars, especially those of the low, sloping, buccal and lingual wall types, which are further complicated in form for the fitting of anchor bands by a fifth cusp on the lingual.

Success having attended the use of overlays as a base of anchorage for the lingual spring wire, buccal attachments were made to the molar overlays that have carried successfully every type of labial arch wire, even to the use of elastic intermaxillary ligatures in the treatment of extreme types of bilateral distoclusion and mesioclusion cases.

CONSECUTIVE STEPS IN THE TECHNIC OF MAKING THE OVERLAY

Foreword.—The consecutive steps in the technic, and the materials used therein are given as the result of careful study, much research work, and sustained application in practice. The mention of certain trade names of materials and apparatus used in the process is not done with the object of favoring any particular manufacturer, but solely with a view to the saving of time and expense in the beginning for those who are interested and may decide to apply the technic in practice, using materials of proved value.

I. PREPARATION

Thoroughly clean and polish the teeth, making it certain that all foreign substances are removed from the cervical portion of the molar teeth. This is positively essential.

II. THE IMPRESSION

With some exceptions, the method of taking the impression will closely follow the technic of Dr. Charles R. Baker, as reported in his clinic before the First International Orthodontic Congress.

A quick setting impression compound which has been softened in water at a temperature of about 130° F. is used in a partial impression tray, the

handle having been eliminated (Fig. 1). The tray is introduced to the mouth, and the compound forced around the teeth and the soft tissues in the usual manner, until the occlusal surfaces of the teeth are close to the tray.

As soon as this has been done, and while the impression material is still soft, the tray should be moved slightly to distort the impression and thus make it larger.

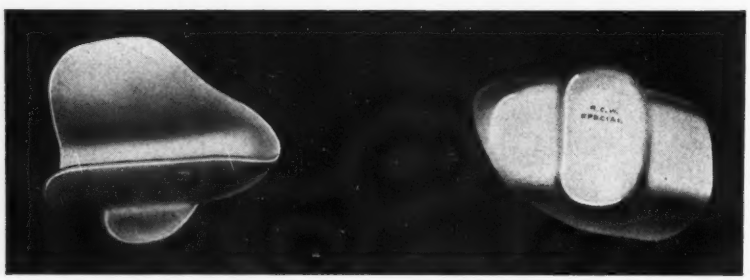

Fig. 1.—The type of trays used in taking the impression.

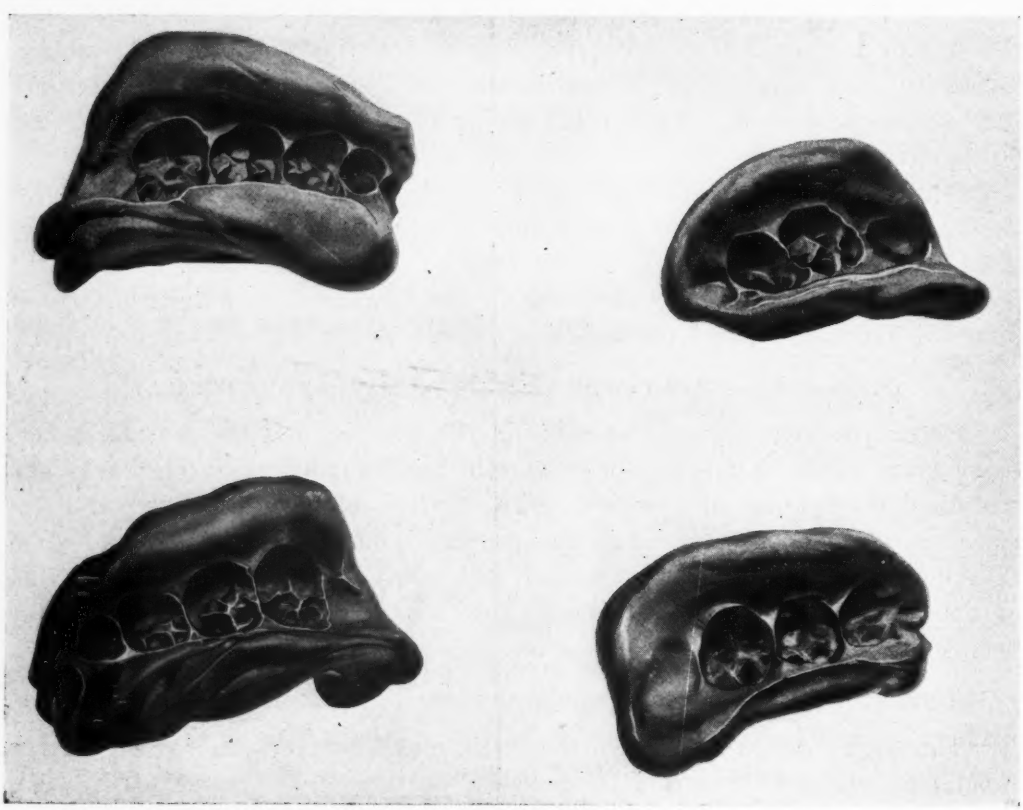

Fig. 2.—Compound impressions after the Baker method.

The tray and impression are now removed quickly from the mouth, and before the compound hardens the impression should be still further enlarged in the region of the molar tooth. This is done by using the end of a finger, or a pellet of wet cotton held in the pliers. The impression is now thoroughly chilled.

A small piece of soft impression compound is now placed in the molar region of the distorted impression and the tray is again placed in the mouth and forced back into its former position. Considerable pressure is used in doing this, and the tray is held firmly in place until the second piece of compound has thoroughly hardened. The setting can be hastened by chilling with cold tap water, or preferably, ice water, and the impression is then removed from the mouth with as little lateral motion as possible in order to avoid any distortion of the same (Fig. 2).

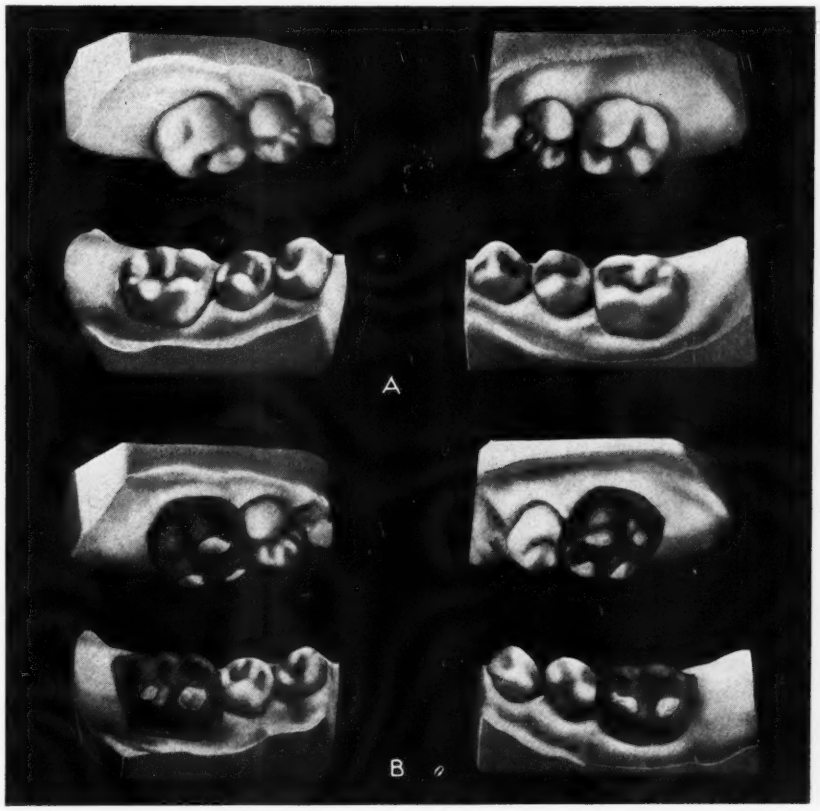

Fig. 3-*A*.—"Loheet No. 1" investment models, over which the sheet wax is adapted and the overlay cast.

Fig. 3-*B*.—Special 30 gauge sheet wax, adapted to "Loheet No. 1" investment models.

III. MAKING THE INVESTMENT COMPOUND MODEL

The compound impression is filled with a well spatulated, thick, creamy mixture of "Loheet No. 1" investment material. This material, when an accelerator is added, should set in about ten minutes to a hardness sufficient for its separation from the impression compound when softened in warm water of about the same temperature as that used in preparation for the taking of the impression (130° F.). The model thus secured is strong, hard, and nonshrinking when subjected to drying out heat not exceeding 300° F. (Fig. 3-*A*).

IV. MAKING THE WAX PATTERN OF THE OVERLAY

While the "Loheet No. 1" investment material model is still warm, following its separation from the impression compound, with the thumb and finger lightly press to place over the selected molar tooth a piece of 30 gauge sheet casting wax. (Ransom and Randolph sheet casting wax is preferred in our practice.) Further adaptation of the wax is made with a cube of art gum which makes the overlay of even and definite thickness when finished. A closer adaptation of the wax at the cervical, and in the sulci of the occlusal surface of the tooth, is secured by lightly burnishing with a

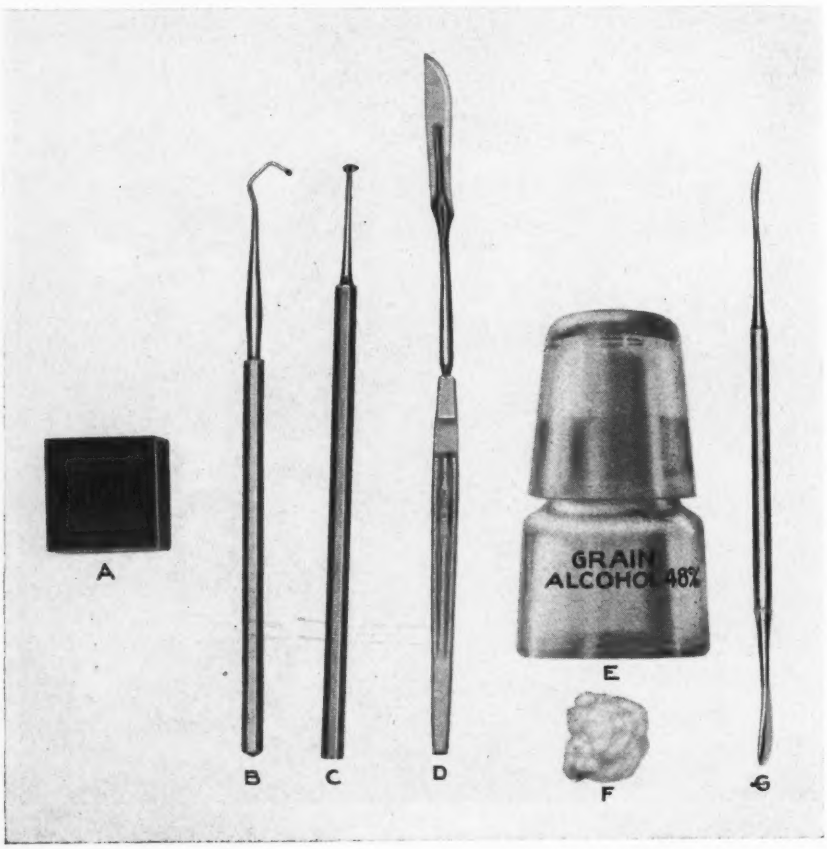

Fig. 4.—The working equipment: *A*, cube of art gum for adapting wax; *B*, and *C*, Burnishers for further close adapting of wax to cervical and in the sulci; *D*, No. 10 Bard-Parker knife; *E*, grain alcohol, 48 per cent; *F*, pledget of cotton; *G*, wax spatula.

small ball-headed burnisher. (The working equipment used in making the wax pattern is shown in Fig. 4.)

The excess wax overlying the cervical margin is trimmed away with a No. 10 Bard-Parker knife blade, leaving about 1 mm. excess around it (Fig. 3-*B*).

The wax pattern may be reinforced by adding more sheet wax, the thickness of which may be reduced by scraping with the No. 10 Bard-Parker knife before applying to the pattern. The adaptation of this thinned-down second piece of sheet wax to the wax pattern on the model is done with a cube of art gum in the same way that the first piece was adapted.

We have found, however, that the addition of wax to the first adapted piece of 30 gauge wax is seldom necessary, as the cast overlay made from a single thickness has proved to be of sufficient strength to answer practically all purposes.

A small ball of hard wax is melted on the point of a wax spatula and placed on the buccal or lingual wall of the wax pattern, for the purpose of attaching the sprue wire.

V. THE PREPARATION FOR CASTING

1. With a sharp plaster knife, trim the "Loheet" investment model down to within 2 mm. of the molar tooth covered by the wax pattern.

2. Thoroughly wash and smooth the wax surface with a 48 per cent solution of grain alcohol. Avoid the use of a stronger solution as it will chill the wax, and cause it to curl from the model.

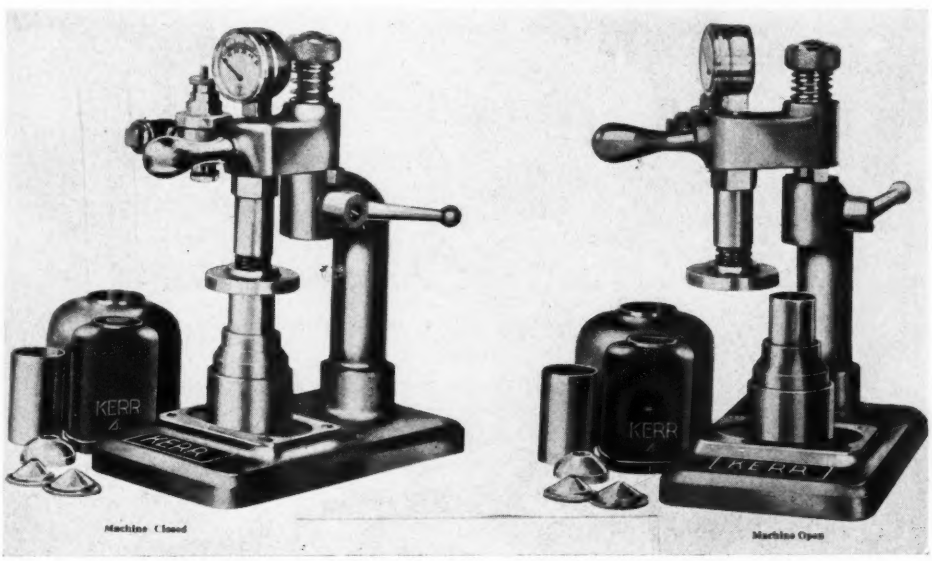

Fig. 5.—The type of air pressure machine to be used in casting overlays.

3. Attach the sprue wire, 16 gauge.

4. Paint the wax pattern and the exposed portion of the "Loheet" investment model with Ransom and Randolph inlay paint, applied with a small, clean, camel's-hair brush, slightly jarring the model while painting, so that air bubbles will be eliminated, and a smooth casting insured.

5. When the layer of inlay paint is well set, mount the model on the sprue former and invest it in the casting flask, using an investment material that will stand a high degree of heat.

6. The wax and moisture may be eliminated by a slow or fast method, but surer and more satisfactory results will be obtained through slow elimination, effected by gradually raising the temperature to a point not exceeding 300° F., and maintaining it there for a period of not less than six hours.

A still better way is to allow the investment to remain in the drying out oven from late afternoon until morning, before casting. A great convenience in this elimination process is an electric drying out oven, equipped with a variable rheostat.

7. One of the cheaper, low grade, precious metal alloys, unalloyed with platinum, or an alloy high in platinum content may be selected for the making of overlays. Both as a matter of economy, and because a wider range of carat in gold solder may be used, it will be found most satisfactory to choose a grade of alloy containing at least 3 to 8 per cent of platinum. An alloy containing a high percentage of platinum can be remelted and used

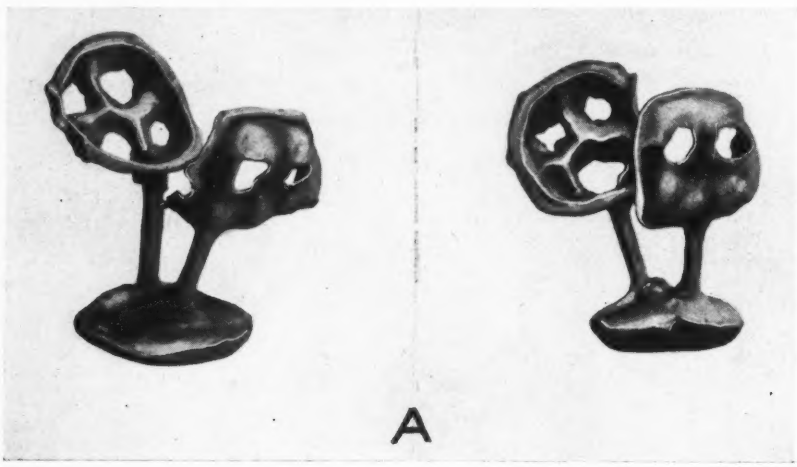

Fig. 6-*A*.—Cast overlays as they appear when removed from the flask.

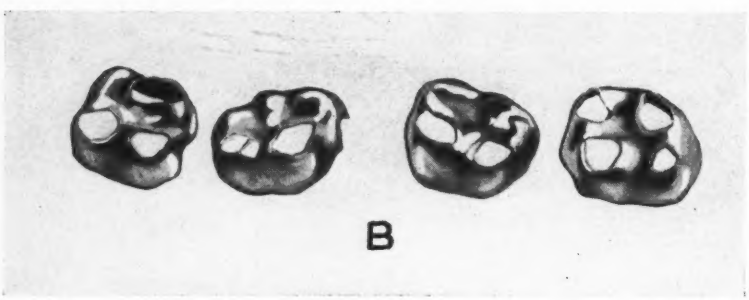

Fig. 6-*B*.—The finished cast overlays.

over many times without loss of desirable qualities, providing of course, that care has been exercised in grinding away all of the solder previously used in the attachment of orthodontic appliance parts. A reducing flux should be used in remelting. The weight of an ingot of alloy for casting one overlay should be four to six dwts.

CASTING AND FINISHING THE OVERLAY

1. There is but one type of casting machine suitable for the casting of overlays, and that is one of the direct air or gas pressure types, twenty pounds of pressure being used. The percentage of failures in the use of a centrif-

ugal casting machine is too high to warrant its use as a means of force. The Kerr Dental Casting Machine is used in our laboratory (Fig. 5).

2. Remove the cast overlay from the flask, when cold. Do not hasten the cooling by immersion in cold water. Clean the investment away with a thin mixture of bicarbonate of soda and water, using a stiff hand brush. Few castings, thus treated, will require pickling in acid. If acid is employed, use 50 per cent H_2SO_4 and in tempering, follow the usual methods. Final finishing is done on the lathe, using first, a carborundum heatless wheel; second, a Crafton wheel; third, Tripoli; fourth, XXXX silex; and for the final finish, French chalk. If there are any imperfections on the inner surface, remove them with engine bur or small mounted stone. In Fig. 6-*A* are shown cast overlays as they appear when removed from the flask and washed; Fig. 6-*B* as they appear when polished. Bebe magnifiers, mounted on spectacle frames (Fig. 7), are serviceable in examining the inner surface of overlays for defects.

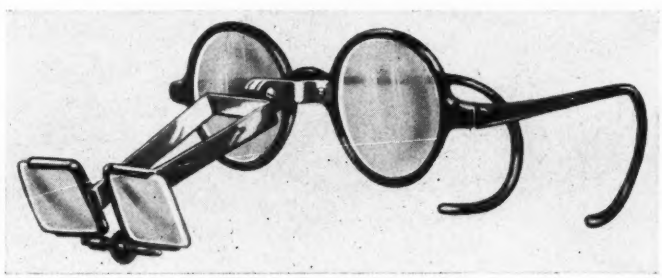

Fig. 7.—Bebe magnifier mounted on spectacle frames, suggested by Dr. Conrad of New York.

THE TIME FACTOR

The time required for making four first permanent molar overlays has been carefully checked in a number of cases, and will run about as follows:

	Minutes
Taking sectional compound impressions (Baker method) of maxillary and mandibular molar regions	10
Mixing and pouring "Loheet" investment material to make models over which sheet wax is adapted	3
Separating impression compound from the "Loheet" investment models, adapting wax, trimming away excess wax, cleaning wax patterns with 48 per cent alcohol, attaching sprue wires, and investing in separate flasks ready for the drying out oven	18
Casting the overlays, as invested in four separate flasks	8
Cleaning investment material from castings and finishing on lathe, ready to be fitted to working models, or on the teeth in the mouth	25
(The time consumed here will vary according to the care that was taken in the earlier steps of the process, when mixing and pouring investment materials, which care has everything to do with the smoothness of the casting and the saving of time in the finishing.)	
Total time for making four overlays	64

It will be noted that in the time required for the consecutive steps of the technic, only ten minutes were spent with the patient in the operating chair, and that fifty-four minutes were spent in the laboratory, this latter phase of the technic being quite within the scope of any laboratory technician possessed of average skill.

Since, in the preliminary work for the making of overlays there is no separation of contact points, such as generally is found necessary in the making and adapting of anchor bands, there has been not only a saving of time in favor of overlay preparation, but the patient has been saved the annoyance caused by the placing of separating materials between the teeth.

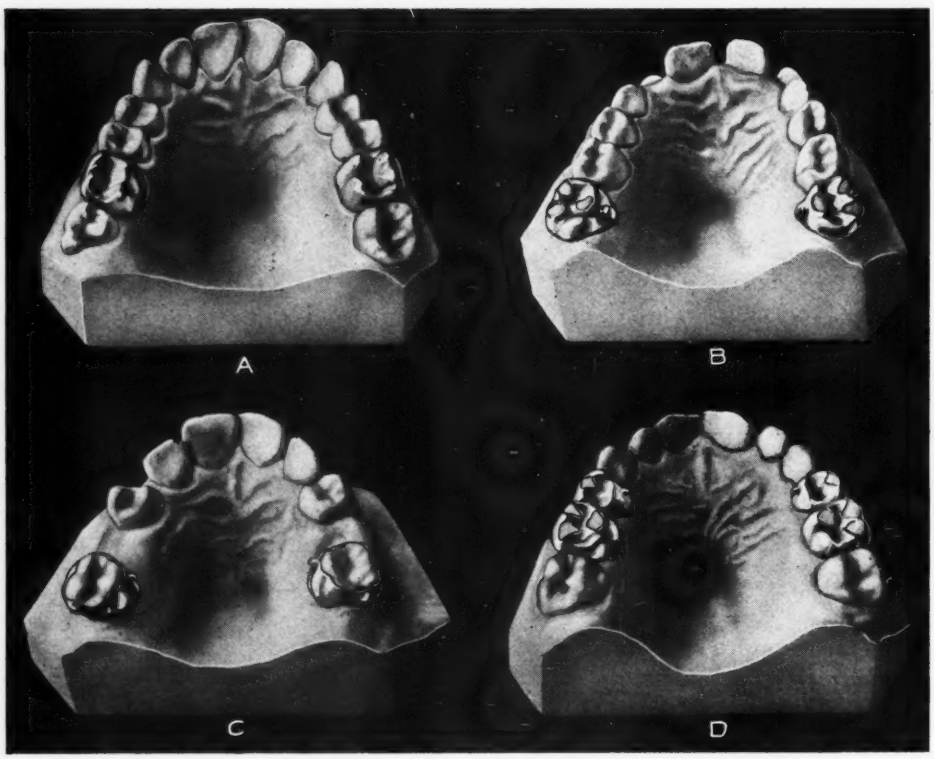

Fig. 8.—Four types of cast overlays: *A*, Overlays covering buccal, occlusal, and lingual surfaces of first permanent molars. *B*, Overlays with three cusps exposed, adaptable to the low crown molars with sloping buccal and lingual walls, further complicated for the adapting of anchor bands by a fifth cusp on the lingual. The open cusp is of advantage in removing the overlay with band removing pliers, without distortion of the overlay. The openings also furnish an escape for cement in setting. *C*, A cast band in cases where there is full access to all surfaces of the crown. *D*, First and second deciduous molars combined in one overlay.

THE COST FACTOR

In view of the use to which precious metals are put in the making of orthodontic appliances, their cost should not be considered as a factor in the choice of materials, still it is of interest, from an economic standpoint, to know just how the expense of materials employed in the making of overlays compares with that used in the making of molar anchor bands.

Aside from the cost of an alloy of gold and platinum content, the other items, which are of small cost in the overlay technic, will not be considered. For this estimation, Dr. Tinker's Formula No. 2 has been selected. It is an

alloy containing 8 per cent of platinum, and has been found to possess the desired qualities and to retain those qualities through repeated fusing. The retail price of this alloy is $1.65 dwt.

The average weight of a permanent molar overlay is 19 grains, and its value is $1.30 when removed from the flask before the finishing process in which 6 grains are ground away. Recovered in the dust-pan as scrap, this, when assayed, will have a value of 27 cents. At these prices and valuations, the actual cost of one molar overlay of average size and weight would be $1.03. The material in this overlay, however, may be used over again several times with a loss of only 14 cents each time.

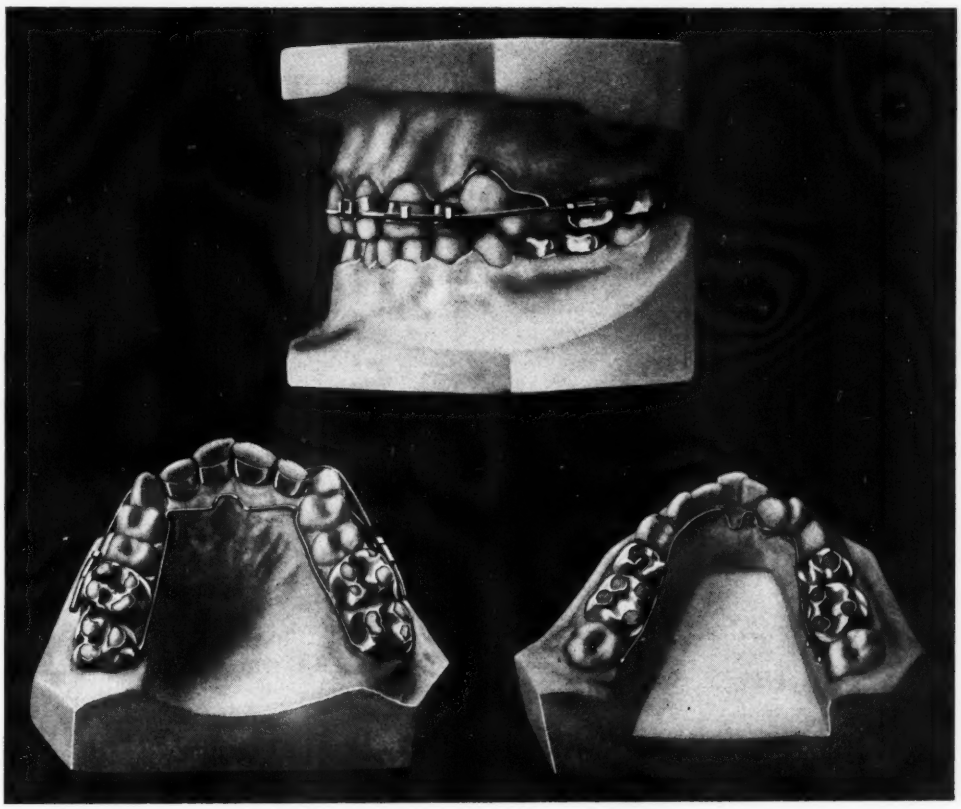

Fig. 9.—Ribbon arch and lingual wire appliance, anchored with combined overlays.

If a band material valued at $2.50 per dwt. is used, one average sized molar anchor band weighing 9 grains, will cost 96 cents, and the scrap, when assayed, will have a value of 42 cents. The average net cost of a molar anchor band is, on this estimate, 54 cents.

The economic advantage of the overlay lies in the fact that it can be repeatedly cast into new overlays with only a slight loss each time, while the band can be used only once.

APPLIED USES OF THE OVERLAY

Time will not permit the enumeration of the variations in the making or the use of the overlay, and only a few of its advantages in application will be cited and illustrated (Fig. 8).

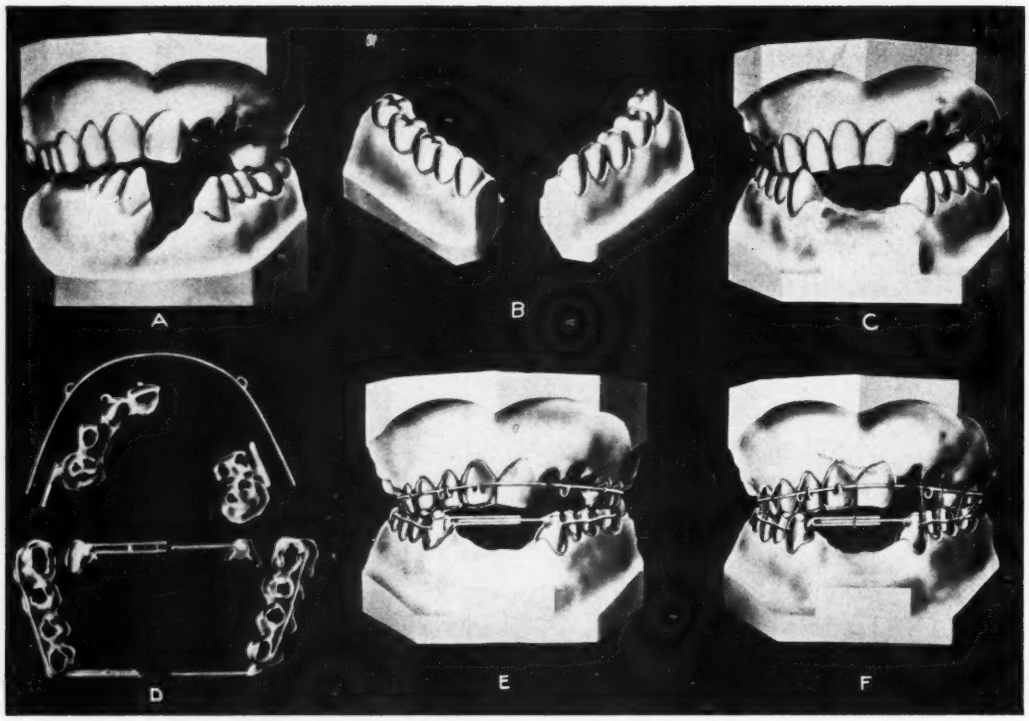

Fig. 10.—Maintenance of jaw fragments: *A*, Models showing the result of a compound bilateral fracture of the mandible, and malocclusion due to displacement of the fragments. *B*, Mandibular sectional models. *C*, Mandibular sectional models assembled and occluded with teeth of the maxillary arch. *D*, Unassembled parts of appliance, showing attachments soldered to overlays. *E*, Appliance assembled on the model. *F*, As ligated when used in the fixation of jaw fragments.

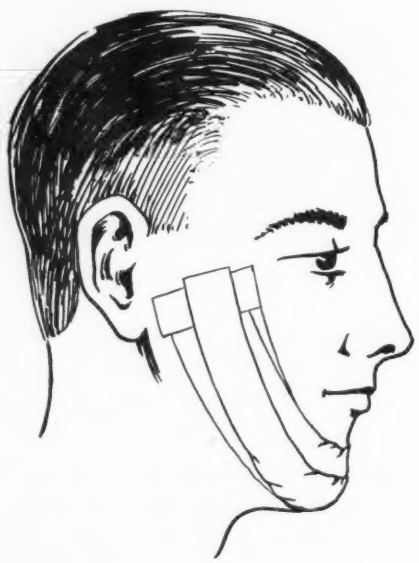

Fig. 11.—The chin fragment held in place by what might properly be called an "overlay," and which could have been cast in metal in the same way as overlays made for the teeth. It consisted of layers of broad adhesive tape, moulded over the chin, and up to the cheek bone on both sides.

1. In the case of the child patient of tender years, where it is most advisable to apply early treatment in the correction of that tendency to mesioclusion exhibited by a linguoversion of the maxillary deciduous incisors.

2. In cases where a combined anchorage of two or more molars is advisable. The overlays can be applied in such cases without doubling up on the thickness of the material between the teeth, which doubling would attend the use of united anchor bands (Fig. 9).

3. In surgical-orthodontic procedures where occlusion of the teeth is involved.

4. In the maintenance of fragments of the jaw in fracture cases, where fixation appliances are attached to the teeth (Figs. 10 and 11). Here the great advantage gained by using the cast overlay instead of lacing the teeth with wire ligatures, or adapting anchor bands, should be conceded by the most skeptical. The comparative comfort afforded the patient in the preparation and placing of overlays in surgical-orthodontic and jaw fracture cases, and the lessened nerve strain on both the operator and the patient, when compared with that involved in other methods of attachment has been proved by the writer through years of experience in the treatment and management of fracture cases.

5. The overlay can be used to advantage in ALL cases where a molar anchor band would be indicated in the use of a fixed orthodontic appliance. The fact that the finished cervical margin of the overlay can encroach no further upon the soft tissues than the free margin of the gum, minimizes the irritation of that tissue.

The metal covering the sulci of the occlusal surface does not seem to interfere with occlusion to the degree of being an annoyance, as some might suppose it would. Patients who have previously gone through the experience of the fitting, cementing, and wearing of anchor bands, invariably express their preference for the overlay.

DISCUSSION

Dr. Abram Hoffman, Buffalo, N. Y.—I am very glad indeed to have the opportunity of opening the discussion of Dr. Willett's excellent paper. In the first place, it is a pleasure because the subject matter has been so well presented, including the beautiful illustrations, as to leave but very little for one to say in discussion and, in the second place, because of the great satisfaction I have had in using some of Dr. Willett's ideas in my own work during the past several years.

I would be quite remiss if I did not say just a few words in commendation of the excellent work that the essayist has presented to us on several occasions. Those of you who attended the International Congress will recall the outstanding case which he presented to us at that time, the completeness of the presentation, the perfection of the detail, the perfection of the technic, and finally the excellent result which he gained, and now today he gives us another presentation which is the result of much careful thought and experiment, details upon which he has spent some years in testing before offering the ideas for general use. He has stood the brunt of the test and today he gives us an idea and a technic that is complete and ready for general use.

Dr. Willett has taken several of us, at least, into his confidence for some time past and we have been profiting from his suggestions.

I am not going into the technic as he has given it to us except in a most limited way because he can do it so much better than any explanation that I might give, but I do want to say just a few words which is perhaps a slight divergence from the paper, but at the same time has such an intimate relationship and bearing upon it that I feel justified in introducing another thought.

Some of us have been using more or less swedged caps or partial crowns in this connection. I feel, however, that the work of Dr. Willett stands out and is very much better than the swedged crown. In my hands I seem to have more success in using the cast overlay than I had with the swedged, but there are men in this room whom I know to be using the swedged cap and who are very partial to it and will speak in its favor rather than in the favor of the casting.

I have used a number of these overlays particularly upon deciduous teeth and it has been a great pleasure to use them. The avoidance of separation to which Dr. Willett has referred is a great point in their favor. Their use upon deciduous teeth stands out prominently. I think that they offer an attachment and anchorage in the case of deciduous teeth that is far better than the ordinary band that we are accustomed to using.

I believe that the cast overlay has a decided advantage over the swedged cap in that it is stiffer, more rigid, can be relieved upon the occlusal surface in a better manner and in case of loosening, it will stand the misuse which may come through the forces of mastication better than the swedged.

I have a great deal of confidence in all that Dr. Willett has said to us. I have a great deal of confidence in anything that he offers to us because I happen to know of the painstaking manner in which he develops all of his technical procedures.

Those of you who have been forunate enough to see the clinics presented by this essayist do not need any further word of commendation on my part. His work speaks for itself.

Dr. Willett has spoken about one of our first necessities being the practice of humane principles. I believe that he has given us a method today which with our younger patients is very much more acceptable than the methods that we have been in the habit of practicing. Certainly it is a great satisfaction to take an impression, whether the Baker technic, that he has described, or a plaster impression is used. From that point one can proceed to develop this anchor band, if one chooses, after the method which Dr. Willett has given us, and then, not only that, but the manner in which these anchor bands fit upon the teeth—how can I say it—almost with a click. They go there and stay there and remain through a long period of hard usage.

I have seen such anchor bands where they have been undisturbed upon a tooth perhaps for a year and a half to two years and that is more than we can say for many of our anchor bands.

The interference with the investing tissues has been touched upon and the additional security which this area over on the occlusal surface of the tooth offers is a great advantage. We do not have to go down and disturb the free margin of the gum at all. I can speak most heartily in recommending and in commending this type of anchorage upon deciduous teeth.

I feel that Dr. Willett has brought us an excellent message today and I am rather suspicious that the discussion of Dr. Eby will go into the technology and will therefore avoid any further reference and just thank Dr. Willett for just another one of your excellent presentations.

Dr. Charles R. Baker, Evanston, Ill.—I should like to say first that I have seen a great many of these overlays that Dr. Willett has made and used and they are all just as good as his illustrations show. He is as careful about making the overlays as about preparing the paper.

I want to thank him for mentioning my technic of taking impressions of molars and I want to call attention to the impression trays which he uses and which you can see in

the illustrations. These trays have a transverse handle projecting out on both sides, buccolingually. This is Dr. Willett's idea and a very desirable improvement.

Dr. Joseph D. Eby, New York City.—No one is more capable of dealing with this subject as a problem in the study of anchorage than Dr. Willett. This paper is characteristic of the careful fore-thought, accurate planning and skill with which Dr. Willett accomplishes his work.

In the early part of his paper he refers to the fact that many men are loath to change their methods of current practice, or the things that have been worth while to them because of their fear of criticism and the "fire of opposition." I think this is true because of the natural tendency to adhere to some familiar method or technic even though it may not be altogether satisfactory. It may also be partially due to the fact that in this particular day and age there is such a wide variance in office methods, which are evolving so steadily that one must be very wary and cautious in making important changes in design or technic. It will require many years of education and practice in principles founded on established facts before methods of appliances or parts thereof will become more generally uniform.

Dr. Willett presents for our consideration something which is not new, but which, as a substitute for the conventional orthodontic band for anchorage, is an innovation to routine practice. Orthodontic literature possesses a great amount of reference to built-over attachments, originally suggested for opening bites for various purposes. The literature on record from the works of Dr. J. Lowe Young, as referred to by the essayist are alone most illuminating. Our knowledge of development of bone which causes lengthening of the jaws along the alveolar borders is sufficient to cause a study of the positions of teeth in vertical dimensions. The concurrent thoughts of Dr. Young and others have dealt more with treatment of vertical relations and the resultant disturbances of occlusions, using the cusp-covering "overlay" as a direct medium of controlling the plane of occlusion. This is particularly true prior to and during the eruption of permanent teeth, and also to utilize such overlays as an anchorage for appliances as a secondary consideration. Dr. Willett brings us this subject modified into the form of a principle of anchorage which subserves all the finer reasons and effective results as a fit substitute for, if not an improvement on a properly fitting plain band.

Much is to be said on the subject of bands. I think the first rule for any principle of anchorage should be the complete compatibility with its environment from a hygienic and nonirritative point of view. Following this closely is the matter of security of attachment. In the best technic for the construction of bands, all painful methods should be avoided. Undue stretching of the corners of the mouth, cutting of lips, cutting into soft tissues around teeth, and lacerations from the slipping of instruments are intolerable and unnecessary. The constant slipping loose of anchor bands which are not properly fitted is a disgusting nuisance—and any form of band whether ill-fitting or otherwise, which will permit of the danger of decalcification of enamel had better be left unattached.

The ideal conception of an anchor band is one that is made of a material sufficiently flexible to adapt itself to all the variations of the anatomical outlines of the teeth, at the same time being sufficiently thick and rigid to withstand the stresses and strains to be borne against it. A band of this nature, particularly if seated with a driving finish must be practically sprung to place. Regardless of whether made by direct, indirect or modified methods, it fulfills the general conception of the best specifications required.

Dr. Willett refers to the faults of anchor bands. He speaks of the discomfort etc. associated with the gaining of sufficient working space by methods of separation between the teeth. It is true that to some patients this is an uncomfortable venture, but nevertheless I do not regard that this should be treated as a serious criticism or something necessarily to be avoided. Likewise in the second point under this heading he refers to the displacement of proximal contacts between the teeth, inferring that the width of band material involved interferes with occlusion. I am not inclined to believe that this can be regarded as a very serious factor. I do not think that the hand of man is capable of establishing an occlusion so fine but that Nature will not cause greater than this amount of adjustment of form when all restraint is released.

If a band is made properly by scalloping it slightly interproximally I do not think that it will cause much interproximal irritation. When a band breaks and slips clear down around the neck of a tooth or is so much too large that when it loosens it may gradually drift downward, a severe punishment results, but if a band comes within hailing distance of fitting and is made of decent material this liability is practically nil. I cannot believe that this method can be regarded as a substitute for bands in the majority of cases, and yet I would not state that it is not superior to bands and better indicated in many important cases. It is my belief that its use in deciduous or mixed dentures requiring treatment is appropriately indicated. I also believe that in those cases where the six year molars are decidedly malformed by faulty development, the cast band or cap is quite appropriate. This method may also be employed in cementing securely a cuspless top over well-formed molars, but I would be fearful of producing decalcification along the marginal lines of contact if the material did not pass over the entire proximal surface. I cannot help but believe that the effect of depressing molars or elevating teeth thus taken out of contact sometimes works adversely.

The work which Dr. Willett has given us is highly applicable as an efficacious method of anchorage in the construction of splints. I believe that the splints which I have seen come from his hands, and in which he has used this method of ancorage are as effective as any I have ever seen.

I wish to thank Dr. Willet for his able paper, the beautiful manner in which he has expressed his carefully meditated thoughts. I believe that this method of anchorage has a place in the practice of every orthodontist, and that we should make ourselves familiar with this technic as the ideal procedure in indicated cases.

Dr. Willett.—I certainly appreciate the discussion of my paper by Dr. Hoffman and Dr. Eby. It was worth all the effort to write the paper. The writing of this paper was not difficult because the subject matter was gleaned from everyday practice in the way I regularly apply it.

Dr. Eby raised a question in regard to overlays not covering the approximal surface of the tooth, leaving the way open for decalcifcation of the enamel. The overlay should be so made that it will be retained in place without an overhanging edge at the contact point that would catch and retain accumulations. If it is a single overlay, it is a very easy mattter for the patient to carry a prophylactic tape between the mesio and disto contacts thus cleansing natural tooth structure. A band never forms a satisfactory contact with the enamel of the opposing tooth. That has been my experience.

It was in the cases of the most hypersensitive, neurotic patients where I first resorted to the use of the overlay anchorage in orthodontic treatment. I am certain that I could not have managed to carry on treatment for those patients using anchor bands, particularly in cases of submerged molars. The overlay can be securely cemented to such teeth with comparative comfort to the patient. I thank you for your attention.

THE PHYSIOLOGIC PROGRESS OF THE BONE CENTERS OF THE HANDS OF NORMAL CHILDREN BETWEEN THE AGES OF FIVE AND SIXTEEN INCLUSIVE; ALSO A COMPARATIVE STUDY OF BOTH RETARDED AND ACCELERATED HAND GROWTH IN CHILDREN WHOSE GENERAL SKELETAL GROWTH IS SIMILARLY AFFECTED*

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(Concluded from November issue.)

VARIABILITY OF PHYSIOLOGIC GROWTH

THE phenomena of growth characteristics have already received a vast amount of study. Professor Franz Boaz, in his compilations of certain physical measurements of groups of children,[5] proved that the rate of growth is not progressively parallel in any two children of the same age. An explanation of this variability of growth was, for a time, accepted as a normal phenomenon of nature's processes. Recent investigators seem to have established the fact that school children present what is termed "seasonal growth." Veeder and Rohlfing, in their *Studies in Pubescence Growth,*[6] find that "in the group between ten and fourteen years, the gain is fairly evenly distributed throughout the year. From fourteen to eighteen years the gain is chiefly in the period from October to January, inclusive. Little gain takes place in the latter group during the summer vacation months. The period of maximum gain occurred in the fall months for 40 per cent, and in 25 per cent in the summer months (chiefly in boys under fourteen); and in only 5.5 per cent was the gain fairly uniform throughout the year. Only 5 per cent lost weight in the fall months as contrasted with 18 per cent in the summer months. Figures regarding the average gain give little information as to the actual gain made by an individual boy. It cannot be said that the average periodic or annual gain is the gain that should be made for a specific individual. In going over the records, one is struck by the way that a gain considerably more than the average in any one year is either preceded or followed by a year in which the gain is considerably below the average." Their tabulation further shows that the greatest gain in both weight and height occurs between the ages of twelve and fifteen or at the period of pubescent development when glandular activity is at its greatest height.

In discussing "Seasonal Variation in Growth in School Children,"[7] Emerson concludes that "there does not appear to be any evidence to justify

*Read before the American Society of Orthodontists, Buffalo, N. Y., May, 1928.

considering these seasonal variations of gains in weight as a normal biologic phenomenon for healthy children under favorable conditions of environment." * * * "A child who fails to gain in weight each month at least up to the age of ten years is in all probability suffering from some form of infection or fatigue in which diet, housing and school attendance may play important contributing parts. Groups of children living under favorable conditions can be found who, in the absence of infections or other sickness, exhibit a regular monthly gain in weight regardless of the season of the year." His group study was on children from five to ten years of age.

Differences of opinion as to the causes of variations in growth periods of children are of no immediate concern to the orthodontist. Our interest, however, should be attracted by the fact that a periodicity in growth gain *does actually exist* in many children and such knowledge should influence the selection of an opportune time for orthodontic interference, as well as the determination of "rest periods during treatment."

FIG. 1.—PATHOLOGIC DWARF

Female, age 12, height 40½ inches, weight 33½ pounds.
Diagnosis: Undernourished, incipient pulmonary tuberculosis and rickets.
Treatment: A balanced diet, cod liver oil and antuitrin.
Patient grew 1⅜ inches in thirty-five days.
According to Prof. Boaz it is probable that this child will never attain her inherited morphologic stature for in substance he says—"Regardless of a period of accelerated growth following a long stage of retarded growth the child will fail to attain its normal stature."
See photographs of dental arches and roentgenograms of hands.

Our studies of bone progress in the carpus and epiphyses of more than 2,400 individuals in an attempt to correlate jaw and hand bone growth are not yet entirely conclusive. The following facts, however, will indicate how nearly parallel is the growth progress of these two extremities:

1. Between eight and twelve months after birth three bone centers of the hand appear,[8] the os magnum, the unciform, and the epiphysis of the radius. At the same time the central incisors erupt. Both are evidences of bone progress.

2. By the age of three years all of the nineteen epiphyses of the metacarpals and phalanges have begun to form; and in addition, the cuneiform and semilunar are in evidence. By this time all deciduous teeth have taken their places, which is definite evidence of jaw growth.

3. From three to seven years the trapezium, trapezoid, and scaphoid begin to ossify, the epiphysis of the ulna appearing about the age of six years.

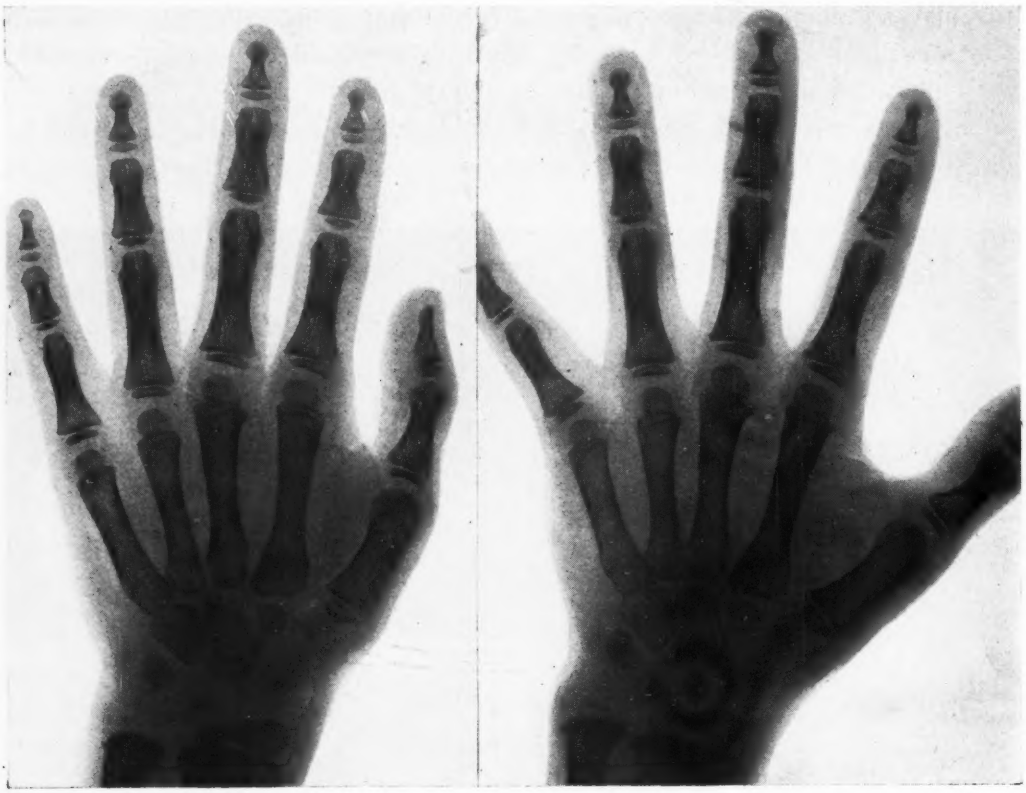
FIG. 2.—THE DENTAL ARCHES OF PATIENT SHOWN IN FIG. 1 (A PATHOLOGIC DWARF)

The deficient width of the dental arches is graphically illustrated by the displacement of all lateral incisors. Their failure to accommodate a normal placement is only one expression of retarded body growth. An orthodontic appliance would serve best during a period of accelerated growth. To restore an ideal occlusion would seem most unfavorable.

During this same period "growth spaces" should normally occur between the incisors, as well as an increase in the length of the jaws for the reception of the first permanent molars. This comparison may be continued to the age of maturity with the same degree of analogous findings.

Hellman has demonstrated other directions of jaw growth which add to the value of this study. He also called our attention to the "different rates of speed (of jaw growth) at different periods of time,"[9] which fact may also apply to hand growth. Whether the "rates of speed" are exactly parallel in both extremities remains a problem for further investigation. Sufficient evidence, however, has been given to prove that osteogenetic advancement of the hands and jaws is closely parallel, and our routine in making a roentgenographic hand study of all cases presenting either a retarded or accelerated jaw growth seems a practical procedure.

Such routine study of hand bones gives information of growth characteristics even more convincing than we now know to exist in the jaws, though from the standpoint of inherent growth, both are governed by the same general laws. Professor Boaz, in his studies on "The Growth of Children,"[10] says "it is true that a close correlation between the status of the physiologic development of the various parts of the body exists. * * * The correlation is so close that the condition of the bones or that of pubescence gives us a better insight into the physiologic development of the individual than his



A. *B.*

FIG. 3.—A STUDY OF HAND BONE PROGRESS IN FIG. 1 (A PATHOLOGIC DWARF)

These two roentgenograms were made thirty-five days apart. Note the advancement *B* as compared to *A*. In other words the increase in height of 1⅜ inches in thirty-five days shows a marked advancement in bone progress of the hand over that short period of time.

actual chronological age, and may therefore be advantageously used for the regulation of child labor and school entrance as Rotch and Crampton advocate."

Applying his conclusions to our problems, a child, say of eight years, having only three carpal bones, with the absence of the epiphysis of the ulna, as well as evidence of retardation in other osseous centers, should be interesting as a general bone study.

Although our previous article on the study of correlated bone growth called attention to the importance of hand study in selecting the most advan-

tageous time for beginning treatment and determining "rest periods" during treatment, it remains a problem so misunderstood as to justify further

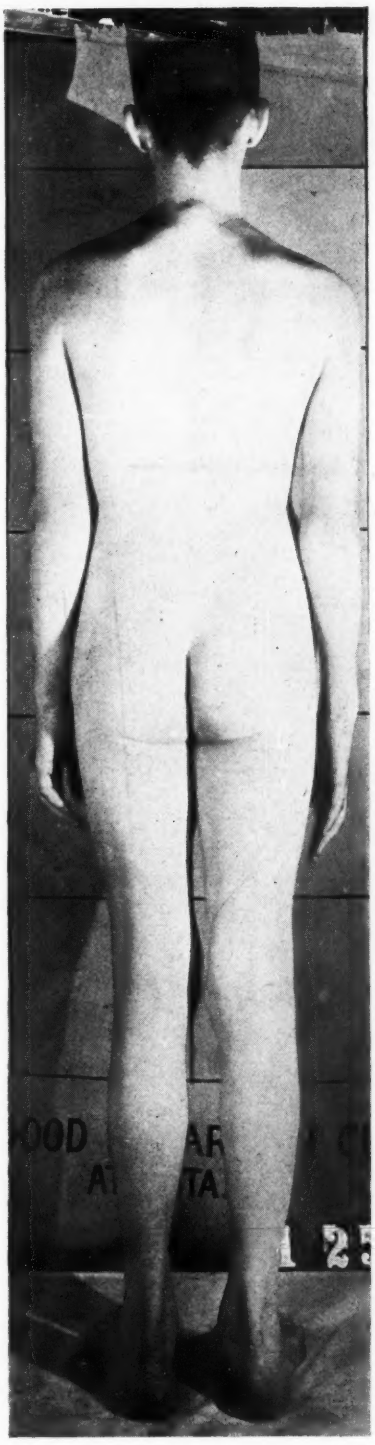


FIG. 4.—PATHOLOGIC GIANT

This boy, age 12, gives a history of having grown twelve inches in twelve months. His case was diagnosed as a hyper-anterior lobe pituitary dysfunction. His height was six feet, five and a half inches. His hands and feet are of excessive size. His skin and feature appearance suggests acromegaly.

Observe the contrast of this giant with the negro girl, a pathologic dwarf, also twelve years of age.

These two cases, of course, would be easily recognized at a glance. There is, however, a great group of intermediate cases which would show a correlation existing between jaw and body growth if a routine physical study was given an opportunity to unfold its findings.

consideration. A child presented for orthodontic treatment whose jaws and arches show evidence of retarded growth, *should be regarded as a case for correlated study rather than for immediate treatment.* Our observation of hun-

dreds of children, who received a complete physical study, proved that the majority of retarded jaws and arches, especially in prepubescent cases, are associated with a general retardation of skeletal growth. This fact is significant and should stimulate a much broader study of our problems.

The child of retarded growth should be weighed and measured and a radiogram should be made of the hand. After an elapse of several months a check of previous records will give sufficient information to demonstrate whether growth is active or inactive. Should this study prove that the child was not in an active state of general growth, the application of local mechanical stimuli to promote jaw and arch growth would be decidedly *contraindicated.* If, on the other hand, general growth processes are in evidence, certainly we would have a scientific explanation for assisting nature to overcome a distorted link in her anatomy.

But this is not all. In some cases treatment is begun when a favorable acceleration of general growth is present, but during treatment a retarded

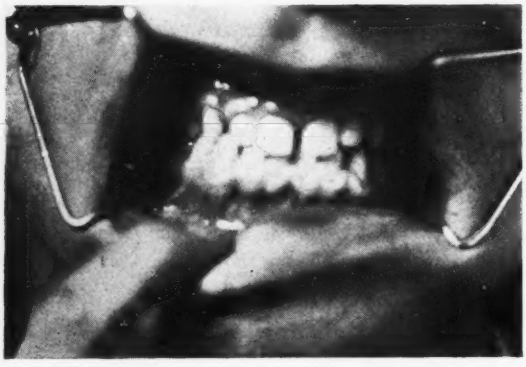


FIG. 5.—THE DENTAL ARCHES OF THE PATIENT SHOWN IN FIG. 4 (A PATHOLOGIC GIANT)

With the exception of the third molars all permanent teeth are fully erupted. Wide spaces are noticed between both the upper and the lower incisors, as well as distal to the canines. His arches certainly correlate with his general skeletal growth. Compare the dental arches in this case to those of the pathologic dwarf of the same age (Fig. 2).

stage is reached. In this event, when the processes of general growth are dormant, continued orthodontic stimulation certainly would not be very beneficial.

Morse's recent contribution, on "A Consideration of Continuous Treatment,"[11] very forcibly argues the value of "rest periods" in the type of cases now under consideration. In addition to appropriately applying a number of biologic facts to our problems, he summarizes his argument, in substance, in the following paragraph: "It is obvious that the factors that direct development and make its progress possible are at least twofold; those which are called intrinsic and those which are called extrinsic. It is these factors with which the orthodontist must deal. Though we may be able to control them to a certain extent, we cannot change the principle upon which they work. If our method of treatment is contrary to their ways, they will surely thwart us, finally taking the task of development into their own hands and finishing

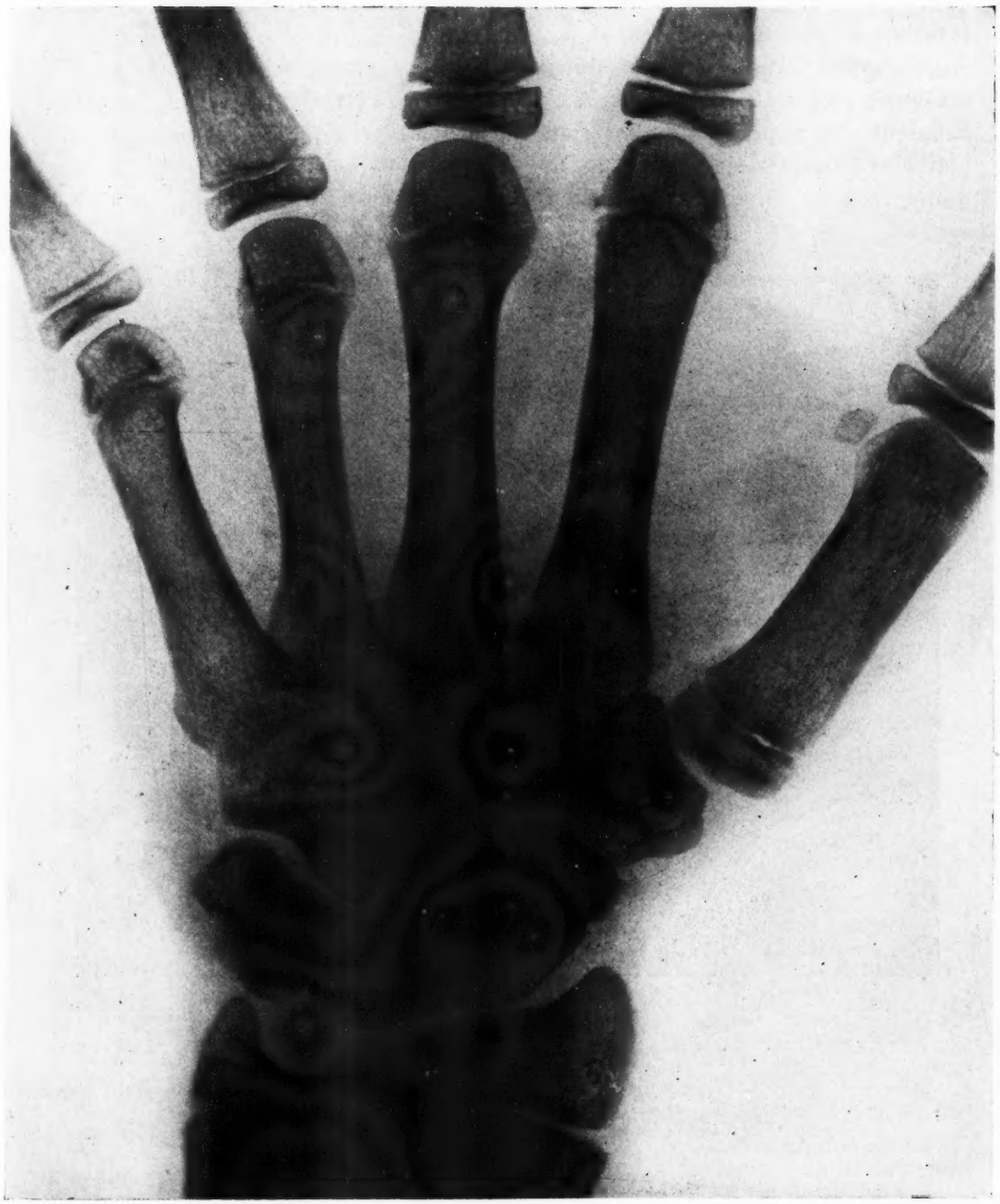


FIG. 6.—A STUDY OF HAND BONE PROGRESS IN FIG. 4 (A PATHOLOGIC GIANT)

Compare the acceleration of growth of all the bones of this hand to the hand picture of the "normal" twelve year old male. Also compare this hand picture to that of the pathologic dwarf (Fig. 3), who was also twelve years of age. Orthodontic appliances would serve of small value in this type of acceleration. Certainly they would not prevent a further progress in jaw growth.

the job.'' The inference of his last sentence may be misunderstood, since there is a possibility of its conveying the thought that the laws of growth and development *do not always* actually determine the finished job, whereas they inevitably *do* determine it.

Mershon was the first to advocate ''rest periods'' during treatment. His reasons for removing appliances at different intervals was to permit the establishment of a functional adaptation of the teeth without the presence of any artificial hindrance; also to allow ''the whole dental machine to develop under its own function and not by artificial stimulation.'' His reasoning is sound and should be followed as a part of orthodontic routine. We think,

FIG. 6-A.—A STUDY OF THE SELLA TURCICA OF FIG. 4 (A PATHOLOGIC GIANT)

X-ray and reading by Dr. J. J. Clark, Prof. of Roentgenology, School of Medicine, Emory University.

''Sella Turcica unusually large. The anterior and posterior clinoid processes show evidence of pressure. Diagnosis—Pituitary Tumor.''

however, that an actual knowledge of the state of general growth takes a precedent over all other biologic laws.

Perhaps a commonplace illustration will better explain the matter than didactic description. The horticulturist understood the influences of pressure upon a growing twig long before the birth of orthodontia. He knew that if a twig were gently bent over a period of time its shape and form would be changed. He knew also that this should be done during a period of active growth, during the spring and summer months, and that any attempt to change its form during the dormant winter months would only result in

injury. Now we may compare the twig to the problem of jaw growth as influenced by skeletal growth. In the former, climatic or seasonal influences govern cell metabolism and tissue changes; in the latter a myriad of influences may manifest themselves *at any time,* causing a dormancy in skeletal growth. By this investigation as outlined above we are able to determine the most advantageous time for applying mechanical pressure to produce a physiologic change in the jaws of an immature individual.

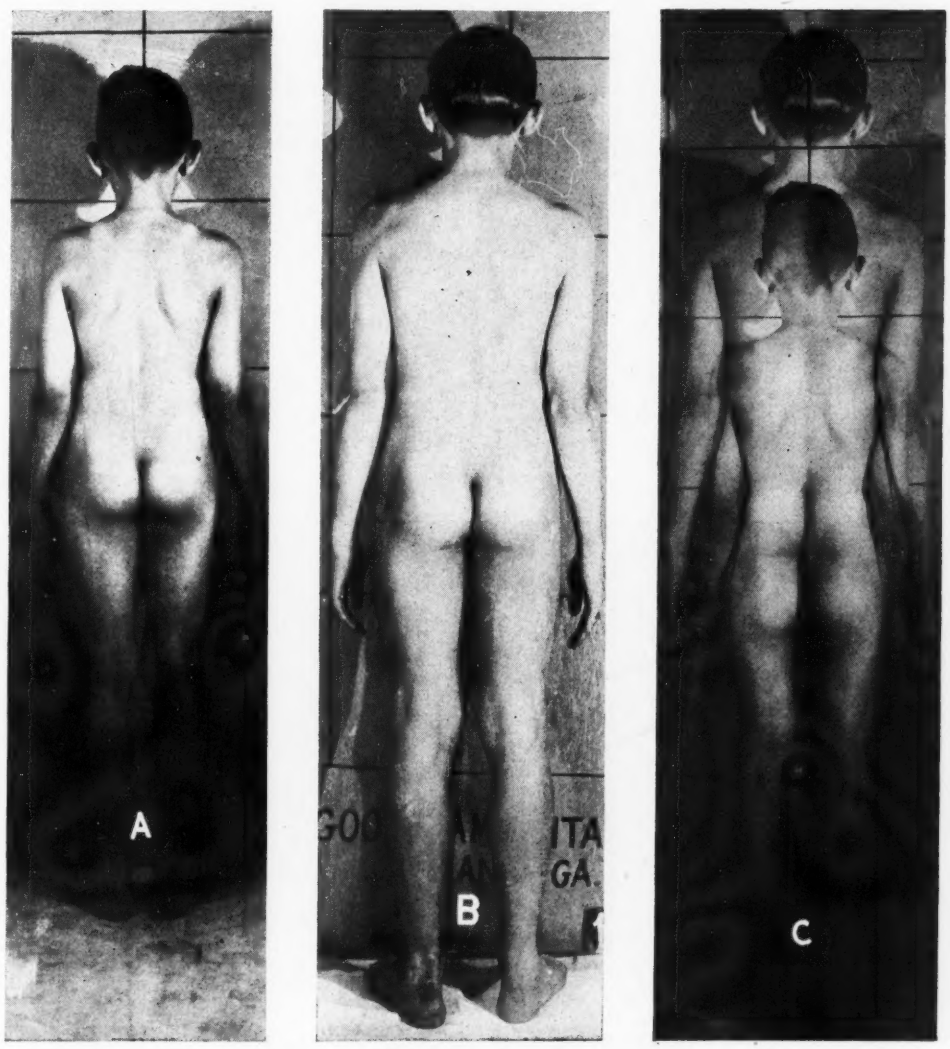


FIG. 7.—AN UNUSUAL CASE OF GENERAL ACCELERATED GROWTH. MALE, AGE FIFTEEN

(A) Male, age 15 years. (B) Same boy 14 months later. (C) Superimposed photograph graphically illustrating skeletal growth.

History.—Growth in stature had been dormant since the age of ten. His general health was good. He presented himself as pictured on the left (A). His height was fifty-six inches.

Treatment.—One-half of one c.c. of antuitrin injected for forty consecutive days. At the end of three months he increased in height three and one-quarter inches. In fourteen months after his first injection of the anterior lobe product his height gain was slightly more than six inches.

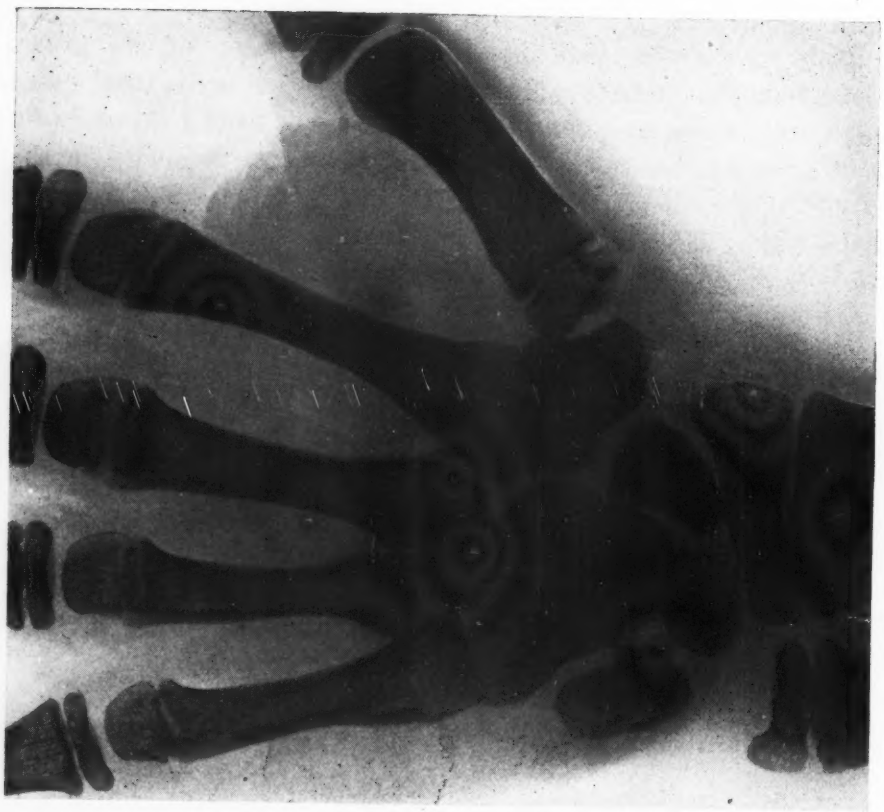


Fig. 8-B.

Fig. 8-A.

Fig. 8-*C*.

FIG. 8—A STUDY OF HAND BONE PROGRESS IN FIG. 7

A, Roentgenogram of hand before endocrine treatment.

B, Picture of hand three months after his first treatment. During this time he grew three and a half inches. Note the downward growth of the epiphysis of the ulna. A sesamoid bone has formed at the distal end of the first metacarpal, also the pisiform bone has made its appearance.

C, This picture was made fourteen months after *A*. Compare with *A* and *B* and note the further increase in bone ossification.

Unfortunately for the progress of orthodontia, our specialty has failed to apply the fundamental laws of general growth to our localized field of operation. Our conceptions of etiologic factors are mechanically explained. The six "forces of occlusion" are analyzed mechanically and their importance as factors in producing normal jaws and arches is exaggerated. Their significance fails when the light of investigation is turned upon them. The "law of bone growth" is also mechanically explained. The orthodontic slogan that *"Bone will grow if mechanically stimulated by a physiologic pressure,"* IS A CIRCUMSCRIBED FACT IN THAT IT IS ONLY OPERATIVE IN ACCORD WITH THE GENERAL LAWS OF GROWTH.

Woodbury's paper,[13] presented before last year's session of this society sensed the instability of orthodontic "bone growth" acumen when he stated "as we felt more confident of our own technic, better able to measure our

Fig. 9-*A*.

Fig. 9-*B*.

FIG. 9.—A STUDY OF HAND BONE PROGRESS IN THE SAME INDIVIDUAL OVER A PERIOD OF THIRTEEN MONTHS

A is the hand picture of the first study.

B was made thirteen months later.

With the exception of a slight contrast due to a difference in exposure there has been no detectable advancement in bone progress. During this period orthodontic appliances would most likely do more harm than good.

own mechanical ability and shortcomings, sometimes we saw things happen that we could not account for—cases that appeared on the surface to be quite similar, behaved, as a matter of fact, quite differently. Although our treatment of two cases might be as nearly as we could judge identical, the one would be a success, while we had to admit that the other was more or less a failure." In other words, Dr. Woodbury at least hinted that *bone does not always grow if mechanically stimulated,* which opinion we share and also add that BONE WILL NOT GROW to any appreciable degree unless inherent growth is active.

It is true that much thoughtful study has been spent upon the biologic phase of our problem,[14] but it seems to us that the *practical application* of these inherent life properties has not been put into full effect. Theories of correct principles are of small value if their applications to practice are not utilized. The evaluation of any specialized branch of medicine is best computed by its conception of the importance of correlated study. The etiology of a retarded or accelerated jaw growth is the least understood of any phase of orthodontia. Our mechanical explanation of jaw deformities represents only a short chapter in a volume whose pages are yet to be understood and written.

Biologic phenomena, as related to growth processes, present such a complexity of interpretation as to preclude the slightest hope of comprehensively

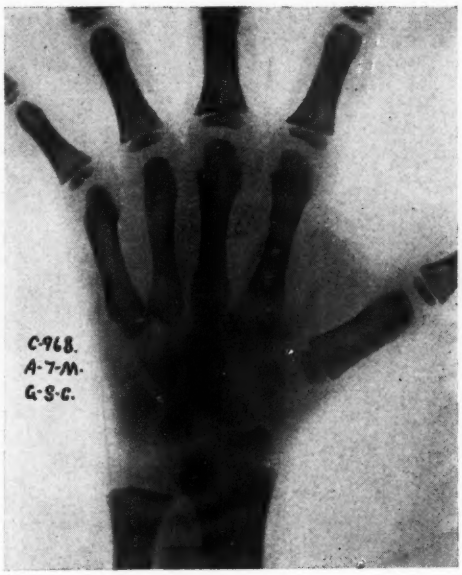


Fig. 10-*A*.

Fig. 10-*B*.

FIG. 10.—A STUDY OF HAND BONE PROGRESS IN THE SAME INDIVIDUAL OVER A PERIOD OF EIGHT MONTHS

A is the first roentgenographic study.

B was made eight months later.

Note the marked osteogenetic advancement. This may have been an opportune time for the application of mechanical stimuli.

describing all of their intrinsic characteristics. But this should not deter us from employing in actual practice a method which might serve as a wedge to break the yoke of localized study.

SUMMARY

(1) Our survey of the hand bones in normal children was made with every possible care. Our summary for each age and sex from five to sixteen, inclusive, should prove of value in establishing the physiologic bone progress in the carpus, epiphyses of the phalanges, metacarpals, and the ulna and radius. The findings herein tabulated differ in a number of respects from

those of other investigators. Few mention the sesamoid bone, whereas we show a constancy in its appearance at the age of thirteen. By comparison it seems significant that our tabulations and readings showed the appearance of the pisiform bone in 90 per cent of females at the age of ten. Other differences occurred in several groups, but their variance from the findings of other investigators was not sufficient to justify comment.

(2) A mechanical derangement of the teeth originating from local influences is not a part of this discussion. A malocclusion of the teeth resulting from a perverted jaw and arch growth is a condition for correlated study.

(3) The jaws and dental arches normally grow according to the biologic laws of growth. If skeletal growth is perverted from its natural channels

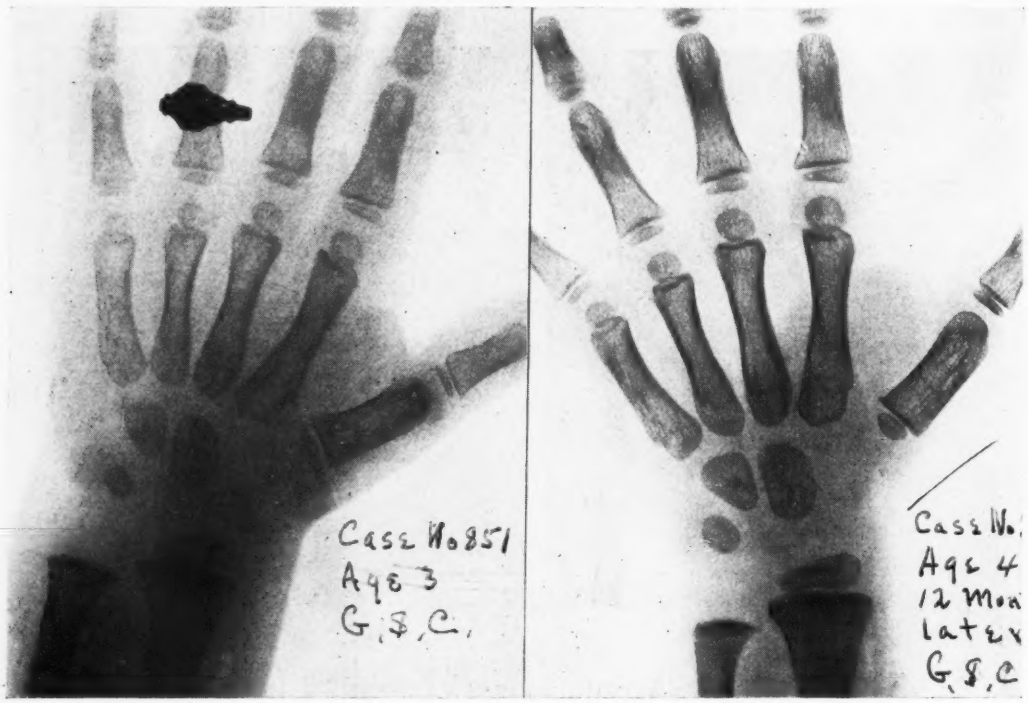


Fig. 11-*A*. Fig. 11-*B*.

FIG. 11.—A STUDY OF HAND BONE PROGRESS IN THE SAME INDIVIDUAL OVER A PERIOD OF TWELVE MONTHS

A was radiographed at age three.

B is the second radiograph made twelve months later.

Only a slight increase in bone progress can be observed. Orthodontic treatment during this period of retarded bone progress may be contraindicated.

the jaws and arches will most likely be proportionately affected. No orthodontic case involving arrested jaw growth should be subjected to mechanical therapy before the status of retarded or accelerated skeletal growth is established. The methods herein described should serve in beginning such routine in orthodontic practice.

(4) Mershon's advocation of "rest periods" during treatment is sound in principle but circumscribed in explanation. A knowledge of retarded or accelerated periods in skeletal growth is of the greatest importance in determining the time for "rest periods" during treatment.

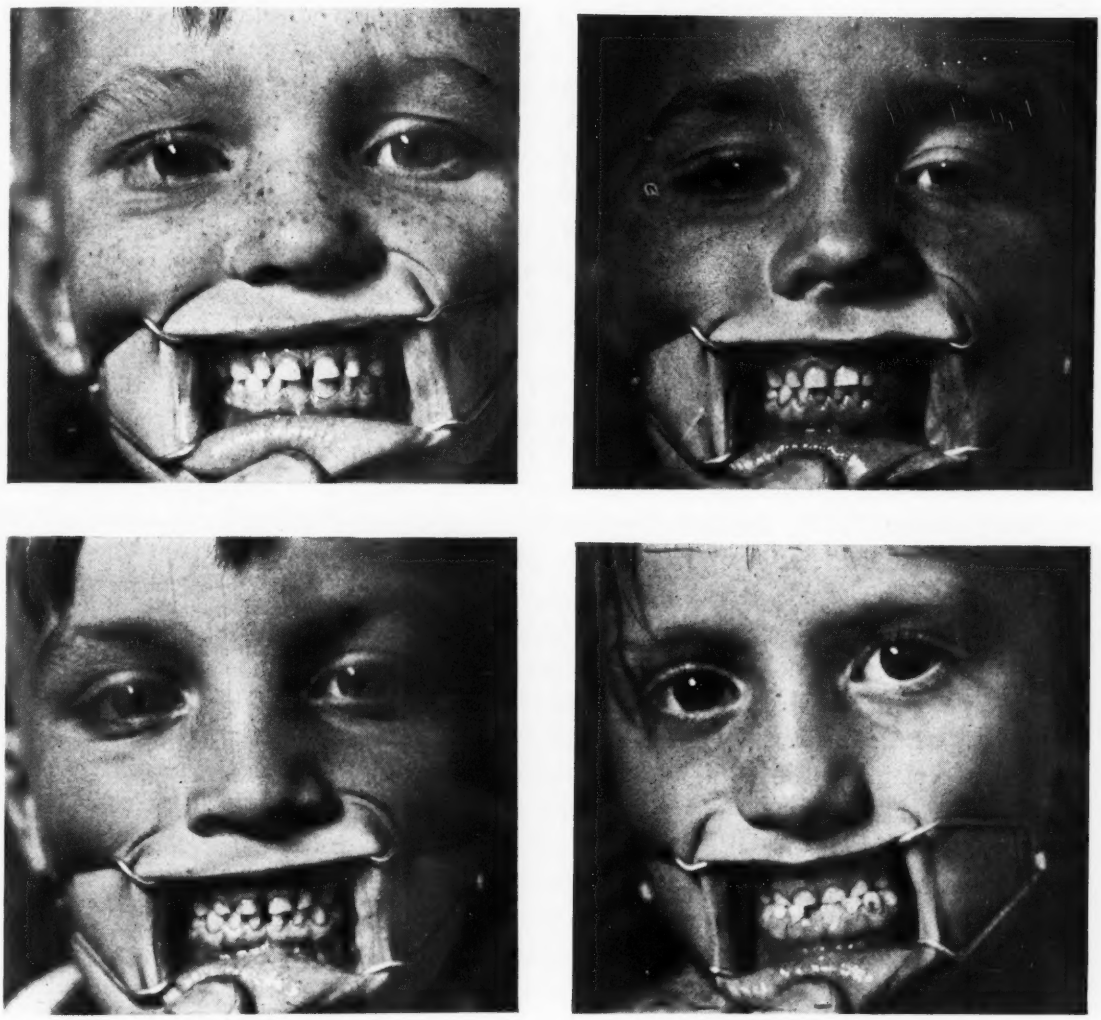


Fig. 12.—All four children are within a few months of the same age, six years. The two boys on the left are normal in skeletal growth. Note the growth spaces between the incisors. Compare the arches of the boy and girl on the right; both are deficient in general skeletal growth—they fail to show any growth spaces between the incisors. At least for the present these are not cases for orthodontic interference. A period of accelerated growth will very probably be reflected in arch growth, making room for the larger permanent teeth. A check on body growth as herein outlined would give information as to the time of onset of general accelerated growth. Should mechanical stimuli be deemed advisable at all, the time for its application would be determined accordingly. The practice of treating such types of cases when they are presented for orthodontic examination should be discontinued. No background of a scientific nature justifies such an inadequate and hurried procedure.

Assuming that appliances are adapted during a period of accelerated growth, a careful check may disclose the onset of a dormancy in growth. Such knowledge would indicate that a "rest period" of mechanical pressures was justifiable. Growth can be lead but not driven by artificial agencies.

(5) Pathologic dwarfs, or individuals otherwise described as those who fail to attain their inherited morphologic stature will not maintain a "normal occlusion" as described by idealistic teachings.

(6) Pathologic gigantism in which the jaws and arches are similarly affected, and they are according to our observations, should not be orthodontically treated during the stage of pathologic acceleration. As a matter of fact orthodontia has little value to render in such cases.

(7) Our study of growth characteristics of the carpus, long bones and epiphyses of the hand has not definitely established a concomitant growth in the jaws. In general both extremities are parallel in growth, but the "rates of speed" may vary. Further study should establish the answer.

ACKNOWLEDGMENT

This investigation, which necessarily required a great amount of assistance, was made possible by the interest and kindness given us by more than two dozen individuals and firms. The principals and medical nurses of each school were unstinted in their help.

Professor Willis Sutton, the Superintendent of the Public Schools of Atlanta wholeheartedly sanctioned the survey. Dr. J. P. Kennedy, Chief of the City Board of Health sponsored the work. Dr. George A. Williams, of the Board of Health rendered invaluable assistance. Dr. J. J. Clark, Professor of Roentgenology at the Medical School of Emory University, gave both time and advice in making the investigation more valuable. Mr. J. G. Burnett, of the X-Ray Department of the S. S. White Company was most kind in arranging the equipment at each school.

The Victor X-Ray Corporation of Chicago, through Mr. Kahl, equipped a CDX Machine especially for this work and gave its use for more than fourteen hundred exposures. They have our grateful appreciation.

Eastman Kodak Company, through Mr. Hodgson of the Medical Division, gave without even the expenditure of express charges nearly fifteen hundred 8 x 10 Dupli-Tized Films. The cost of this material alone would have made the survey almost prohibitive. It certainly showed a splendid spirit on the part of both firms in rendering such invaluable aid in behalf of investigative work.

Lastly, Mrs. Howard gave many tiresome hours in tabulating the thousands of findings made on the twelve hundred films.

REFERENCES

[1]Howard, Clinton C., and Elkin, Arch.: A Résumé of Four Years of Study at The Good Samaritan (Endocrine) Clinic with Special Reference to Seven Hundred X-ray Hand Pictures and Their Relation to General Bone Progress, International Jour. Orth., Oral Surg., and Radiog., 1928, xiv, No. 2.

[2]Cohn, Isidore: Normal Bones and Joints, Paul B. Hoeber, Inc., New York.

[3]Pryor, J. W.: Difference in the Time of Development of the Centers of Ossification in the Male and Female Skeleton, Anat. Record, Philadelphia, 1923.

[4]Eden and Lockyer: Gynaecology, ed 3, 1928, Macmillan Co., New York.

[5]Boaz, Franz: Statistics of Growth, Chapter II—Report of the United States Commissioner of Education for 1904.

[6]Veeder and Rohlfing: Studies in Pubescent Growth, Am. Jour. of Dis. Child., August, 1927, xxxiv, No. 2.

[7]Emerson, Haven: Seasonal Variation in Growth of School Children, Jour. A. M. A., October, 1927, lxxxix, No. 16.
[8]Dorland and Hubeny: The X-ray in Embryology and Obstetrics, Bruce Publishing Co., 1926.
[9]Hellman, Milo: The Face and Occlusion of the Teeth in Man, International Jour., Orth., Oral Surg., and Radiog., November, 1927, xiii, No. 2.
[10]Boaz, Franz: The Growth of Children, Science, December, 1912.
[11]Morse, A. W.: A Consideration of Continuous Treatment, Internat. Jour. Orth., Oral Surg., and Radiog., October, 1927, xiii, No. 10.
[12]Mershon, J. V.: The Removable Lingual Arch and Its Relation to The Orthodontic Problem, Dental Cosmos, June, 1920.
Orthodontic Appliances, Their Use and Abuse, Jour. Natl. Dent. Assn., 1921, viii, No. 3.
Physiology and Mechanics in Orthodontia, Dental Cosmos, November, 1922.
The Removable Lingual Arch Appliance, Internat. Jour. Orth., Oral Surg., and Radiog., 1926, xii, No. 11.
[13]Woodbury, W. W.: Some Questions—Are We Really Trying To Answer Them? Internat. Jour. Orth., Oral Surg., and Radiog., October, 1927, xiii, No. 10.
[14]Johnson, LeRoy: Basic Principles of Orthodontia, Dental Cosmos, September, 1923.

20 Doctors Building.

DISCUSSION

Dr. W. W. Woodbury, Halifax, N. S.—In a recent article Dr. Dewey quoted some one who had described a specialist as a man who knew more and more about less and less. This notable contribution of Dr. Howard, representing as it does a vast amount of work, materially strengthens the point of view insisted on by a group of our leaders during recent years that in orthodontia at least, a specialist must be one who knows more and more about more and more. That to be intensively informed in his anatomically limited field he must be increasingly informed in the larger field of the body as a whole. That we cannot look at our two-by-four area intelligently unless we look with informed eyes beyond that area as well.

Those who have thus insisted that growth and correlated variation are fundamental concepts in a consideration of our orthodontic problems have done us a real service. For some of us it has meant putting life into dry bones. It has given hope and courage in place of a sense of futility and defeat. It has been a breath of reality in a region too much dominated by artificiality and preconceived notions.

We are under deep debt to Dr. Howard for the part he has played in this growing movement. His method is educative. It is the true scientific method. As he tells us in this paper and elsewhere he first became interested in the study of abnormal bone development. Gradually certain correlations seemed to emerge. It soon became evident, however, that a clearer understanding of normal was necessary as a background for the recognition and evaluation of the abnormal. He has patiently collected this large amount of material and then he says to us "this and this and this is normal, although as you see there is considerable variation."

One cannot study this material at all seriously without being profoundly impressed with the overwhelming fact of variation, of the range and spread of what must be considered normal at a given age, and with the dominance of growth. During conversation with a radiologist, a medical man, a few days ago he said "You must remember in the human body there are so many normals," and then cited variations in the form of the stomach and the lumbar vertebrae as examples.

In a recent editorial anent the work of the First International Orthodontic Congress we find the following, "It is significant of the trend of modern views that of the twenty-seven papers presented only four were devoted to technic, the once all-absorbing topic." Is this trend a positive or negative one? Are there fewer contributions on technic because we are powerfully seized with the importance at this time of devoting our attention to a better understanding of growth and variation and the other prime factors necessary for adequate diagnosis; or is it because technic, on which we leaned too hard and too exclusively, has to some extent let us down? Surely these researches in the fields of diagnosis and etiology are going to eventually strengthen our interest in technic. As we realize the limitations

placed upon our efforts by nature we will be all the more anxious to be as effective as possible within these limits. But our technic will thereby rest on a sounder basis.

Again Dr. Howard is to be commended in that he does not present these correlations as a diagnostic cure-all. We are not promised complete and final solution of our diagnostic problems. The range of variability for each age inherent in this exhibit rules out the mathematical precision so dear to the orthodontic heart. We would like to narrow that viriability. Perhaps closer study of the data will enable us to do so; perhaps not. In any case it will make us more familiar with reality. And we are coming to see that it is important to find out what nature is doing; quite as important as to know what we are doing.

Last year Morse, in the article quoted said, "A question naturally arises here, when should there be periods of nontreatment? In the present stage of our knowledge, it is impossible to say with any degree of assurance, for we do not know when the periods of most rapid growth occur, but what is more important, we do not know whether treatment should be pushed with the greatest vigor during the period of most active growth or during the period of retardation." He points to "what Jansen calls the law of vulnerability of fast growing cells, which states, when there is the greatest cellular activity, or when growth is most active, there is the greatest susceptibility to injury," and advises that we should "'stop, look, and listen' before applying an orthodontic device." Dr. Howard makes the same plea to "stop, look, and listen" when he says "A child presented for orthodontic treatment whose jaws and arches show evidence of retarded growth should be regarded as a case for correlated study rather than for immediate treatment." He also suggests that we have in these hand roentgenograms the means for determining when the growth impulse is most active with regard to bone.

At the same time Dr. Howard states definitely that the time to interfere mechanically is during a period of active growth, inasmuch as we cannot create growth—we can only influence its direction. Such a conclusion seems logical and the analogy of the bent twig is persuasive, but in so complex a field both logic and analogy have to bow to the evidence of observed phenomena, and I am sure we would welcome Dr. Howard's clinical experience on this point.

A side issue suggests itself in this connection. In children whose osseous development is not markedly retarded or accelerated Dr. Howard states that "Our studies are conclusive in demonstrating a marked acceleration in the carpus and epiphyses during the period of adolescence as compared to the pre- and postadolescent ages." If better orthodontic results are found to obtain when treatment is carried on during periods of osteogenetic activity, what will be the effect of this finding on the much mooted question of the best time for treatment?

In conclusion, what are we going to do about it? What is the practical application? Dr. Howard does well to insist that it is not enough to recognize these correlations. We must try to make use of them. Only in this way can we gradually test their validity and determine their usefulness. It will be some little time before today's report finds its way into print. I would strongly urge that we make ourselves familiar with Dr. Howard's previous contributions, especially that appearing in the February, 1928, issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY. This will, for the time being, give us as good an index of hand normality as we can get. This will mean some serious work. Brushing up the anatomy of the hand and going over the material until we begin to get a picture of normal conditions for each age. Then let us take hand x-rays, or have them taken, in those cases where Dr. Howard suggests they would be useful.

What will be the result? At the very least we will know a lot more about growth and variation than we do now. It should convince us, if we are not already convinced, that they are dominant factors in the human economy. But it may mean much more. We may have here a most important instrument in diagnosis. As Dr. Howard says in his summary, "The jaws and dental arches normally grow according to the biologic laws of growth. If skeletal growth is perverted from its natural channels the jaws and arches will most likely be proportionately affected." Do not let us be deterred by the fact that Dr. Howard's

claims are modest, that he has only made a beginning in working out the correlations between hand and jaw growth. Let us help him with our active cooperation. Let us think along these lines and use the x-ray as much as we can and keep careful records of our clinical findings. We can thus cooperate in determining the place and value of what seems to be a most promising addition to our diagnostic armamentarium.

Dr. Timothy F. Donovan, Buffalo, N. Y.—I think that Dr. Ellis used a good word in introducing the essayist. He said he was going to treat on a monumental subject, and it certainly is, and it has been a privilege to hear him.

He has brought up many things that might be discussed, but I will confine myself to only a few of them. There is one point that he mentioned which should be emphasized and reemphasized, and that is in your specialty or in any medical specialty, the individual should be studied as a whole.

While there are seasonal variations in growth, Robertson, in his study of "The Chemical Basis of Growth and Senescence" has shown that growth is not a gradual process, but that it occurs in spurts; and that there are three main growth spurts: the infantile, the juvenile, and the adolescent. It is after these great main growth spurts that one is likely to see retardation in skeletal development.

A very interesting point which the Doctor brought up was the difference in time for closure of the epiphysis of the metacarpal bones in females and in males. They close earlier in females. The biologic explanation of that seems to be this: as the doctor has remarked, the average time of puberty in the female is about the age of fourteen, in the male sixteen, and it seems to have been definitely demonstrated that the closure of the epiphysis depends on the secretion from the sexual organs. The female sexual organs are apparently activated earlier than those of the male, hence the earlier closure of the epiphysis. In the eunuch is seen the result of a lack of such sexual secretion in the persistence of epiphyseal lines.

One eunuch I saw at the age of thirty-three showed epiphyseal lines of a boy thirteen or fourteen.

For some time past it has been known that thyroid deficiency is associated with skeletal undergrowth which manifests itself particularly in a tardy appearance of ossifying centers.

A very interesting study has been made on skeletal development, normal skeletal development, and the influence of glandular deficiencies, by Engelbach and McMahon. This was reported in 1925 and it served to emphasize what had been known for some time. They urge not merely the study of the hand, but also the study of the skeleton as a whole.

You can learn much from the study of the hand and wrist, as has been demonstrated, but that a study of the skeleton as a whole is not to be despised is shown by this patient; a boy of nineteen months who had no teeth, who neither stood alone nor walked. He had a very poor appetite, was always constipated, and was querulous all the time. His wrist was normal for the age. The only skeletal subnormality we found was an absence of the epiphysis of the coracoid process of the scapula, which should be present at eight months.

In view of this finding and his general symptoms, he was put on thyroid. Within four months he was standing alone. Within two months he was walking, and at the end of that time he had four teeth. Curiously enough, his central incisors did not appear first. His laterals were the first to appear, so that when he smiled he looked like an ogre.

One point of practical importance that Engelbach and McMahon brought out was this: They say that there is evidence that the thyroid and pituitary compensate for each other. If you have thyroid deficiency, the pituitary will attempt to compensate and you get such a creature as the pathologic giant, a six-foot boy at sixteen years of age, so when you see evidence of an overactivity of one gland, you must consider what it is trying to compensate for.

In my experience one almost never sees a pure thyroid or a pure pituitary deficiency because of this compensatory effect. Engelbach and McMahon described two types of such combined deficiency, the pituitary-thyroid in which the pituitary is the gland first at fault and the thyroid secondarily becomes deficient and the thyroid-pituitary where the pituitary

is secondarily involved. The skeletal findings will be different in those of the first from those of the second. The skeletal retardation will be more marked in those in whom the thyroid is first at fault than in those in whom the pituitary is first at fault.

The history of these patients, as the doctor has pointed out,—their illnesses, their growth, the appearance of their teeth, and so forth, are most important.

The thyroid deficient patient, for instance, has the teething so retarded that in the case of one girl I saw a few weeks ago, aged twelve, she had not yet shown any of her second teeth. She had a marked thyroid deficiency with a secondary pituitary deficiency. Later on the thyroid deficient patient is likely to lose his or her teeth early, and the onset of menstruation may be early or retarded; sometimes as late as seventeen, eighteen, or nineteen years. In the pituitary deficiency menstruation is apt to be early.

I deem it a great privilege to have been asked to come here, and I certainly think you have had a most excellent presentation of this most important subject.

Dr. Jos. D. Eby, New York City.—Dr. Howard's long recognized enthusiasm for the science of orthodontia has ever manifested itself in a strong aptitude for garnering available knowledge in closely associated sciences. He has been patient and faithful in the gleaning of facts which he could bring into the fold, in his efforts to increase the depths of knowledge and broaden the scope of usefulness in the work to which we are all devoted. It was Dr. Howard who first brought the significant associations between the science of orthodontia and endocrinology to the attention of this Society back about 1920, and it has been practically due to his efforts that most of us owe the knowledge we possess on the subject of endocrinology. At this writing I have not read Dr. Howard's paper, and am only familiar with the subject to the extent of knowing that he has been doing a vast amount of faithful pioneering, the results of which are destined to be most illuminating, and I sincerely trust will push the barriers of knowledge into an extended field of valuable information.

Dr. Howard has been kind enough to request that I should present one case to which I have called his attention previously for the benefit it may offer in this discussion. I am ignorant of its definite import, but will present the following facts to the best of my knowledge and ability, in the hope that they may give Dr. Howard the opportunity in his closing discussion to reveal to us some interesting observations on the case out of his interesting store of knowledge.

This patient was brought to me in January, 1926, at the age of fourteen years. His height was 48 inches, span 49½ inches, chest 24 inches, waist 23 inches, weight 57 pounds. He is perfectly proportioned every way, of pleasant temperament, quiet but responsive in disposition, possesses no nervous symptoms, is highly developed mentally, a skillful and industrious lad.

Fig. 1 shows the appearance of his mouth, containing enormous teeth of uniform dimensions individually and correct proportions collectively. My first decision was to defer considerations of the care of his mouth until a time when such maximum growth attainable would be fully demonstrated, and towards this end I referred the patient to Dr. Walter Timme of New York City.

Dr. Timme reported his opinion that the boy was of the Lorraine type of dwarfism, which is frequently difficult to control, expressing his belief, however, in this particular case, that inasmuch as the epiphyses were still wide open, we could hope for moderate success under treatment. He placed the patient on pituitary substance, both the anterior and whole gland, together with small doses of thyroid. The patient returned to see me eight months later, at which time he had gained 2¼ inches in height, 2 inches in span and 5½ pounds in weight. At this time treatment had been stopped on account of the father, and what seemed to me to be an effective response was thwarted.

About this time I wrote to Dr. Howard telling him something of the case, and he referred the details to Dr. Arch Elkin of Atlanta, Ga. From the limited data at hand it was his opinion that the boy was probably a hypoanterior lobe pituitary case with a probably primary dysfunction of either the thyroid, gonads, or both.

In the fall of 1927 the father brought the boy to me again, and I referred them to Dr. Royal S. Haynes of New York City, who has had the boy under observation and treatment for some time, but experiencing the same parental difficulties in the matter of cooperation. Dr. Haynes' report is as follows:

"I find the boy to be a bright pleasant appearing chap with somewhat the facial expression of a dwarf, that is, a smooth tight skin of somewhat yellowish color, with rather prominent cheek-bones. He is 16 years of age, has a height of 51 inches, which is the minimum height for a child of 12 years, and is attained by some children of six years. He comes from a small ancestry, but his younger brother of about 10 years exceeds him in height, and a sister of 7 years is 43 inches tall, which is towards the lower range for her age but within normal limits. His body is very square, chest high and thick, testicles undecended, his voice that of an unmatured boy. He was not of the classical hypopituitary type, resembling more the hypoadrenal type. The radiographic examination failed to disclose any abnormality in his intestinal tract. His skull showed a certain amount of con-

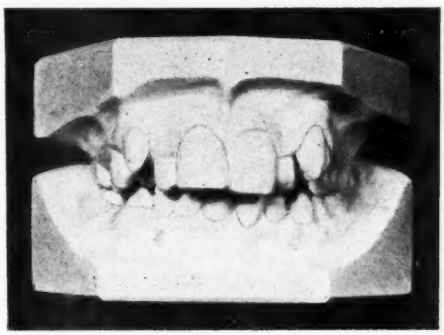


Fig. 1.

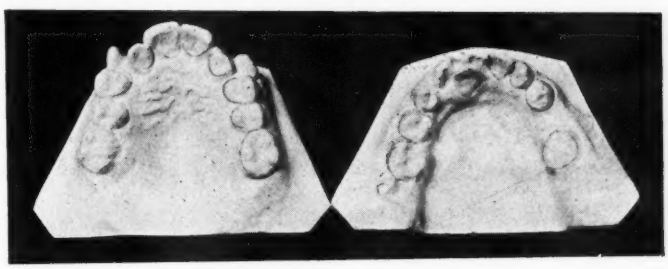


Fig. 2.

volutional atrophy. His sella turcica seemed normal in size. An examination of his epiphyses showed the development of a ten year old child. There is a peculiar condition in his shoulder joints which appears to be a double subluxation. He was put first on a little thyroid and adrenal cortex in connection with a carbon arc lamp radiation. He was seen at weekly intervals for two months and a little change was noted. His expression improved and was less 'Tom Thumbish'—his testicles became somewhat larger and could be pushed down into the scrotum. Later he was placed on 4 grains of anterior pituitary gland,"—following which time he was not seen again by Dr. Haynes. Dr. Haynes also reports that there was Addison's disease in his family—the laboratory examinations were negative.

Fig. 2 shows the occlusal view.

Fig. 3 is the lateral view of an extraoral radiogram showing the huge size of the teeth in relation to the diminutive size of the mandible.

With this information which presents the general idea of the condition of this boy, I now wish to present Fig. 4, which shows a radiogram of his wrists, which we shall leave for Dr. Howard's discussion, and his opinion as to the evidence which may be presented.

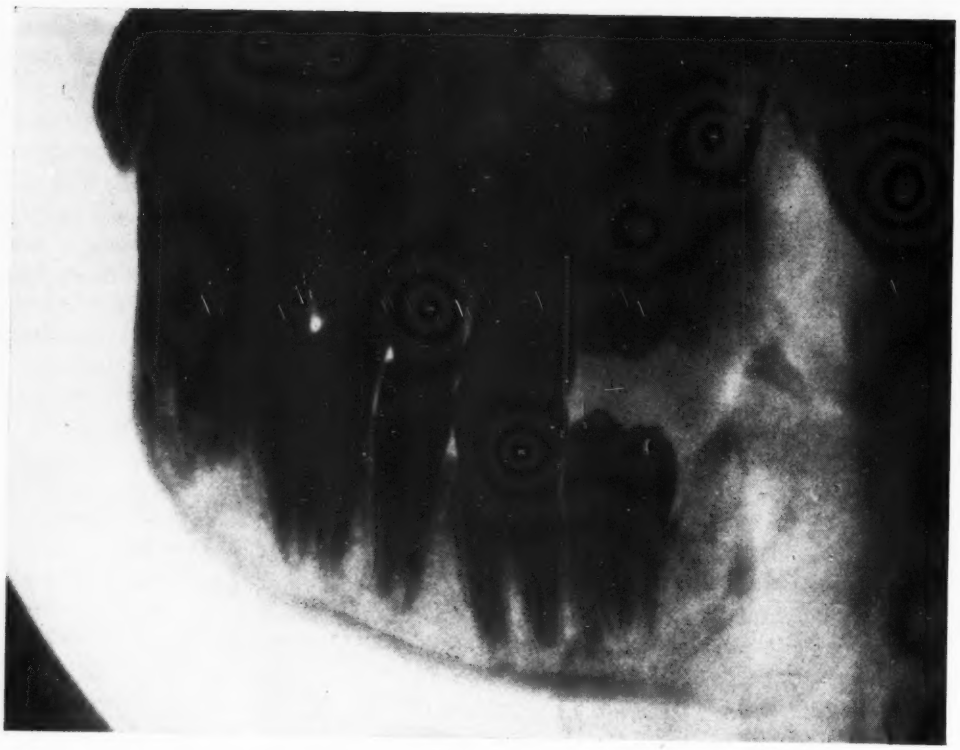


Fig. 3.

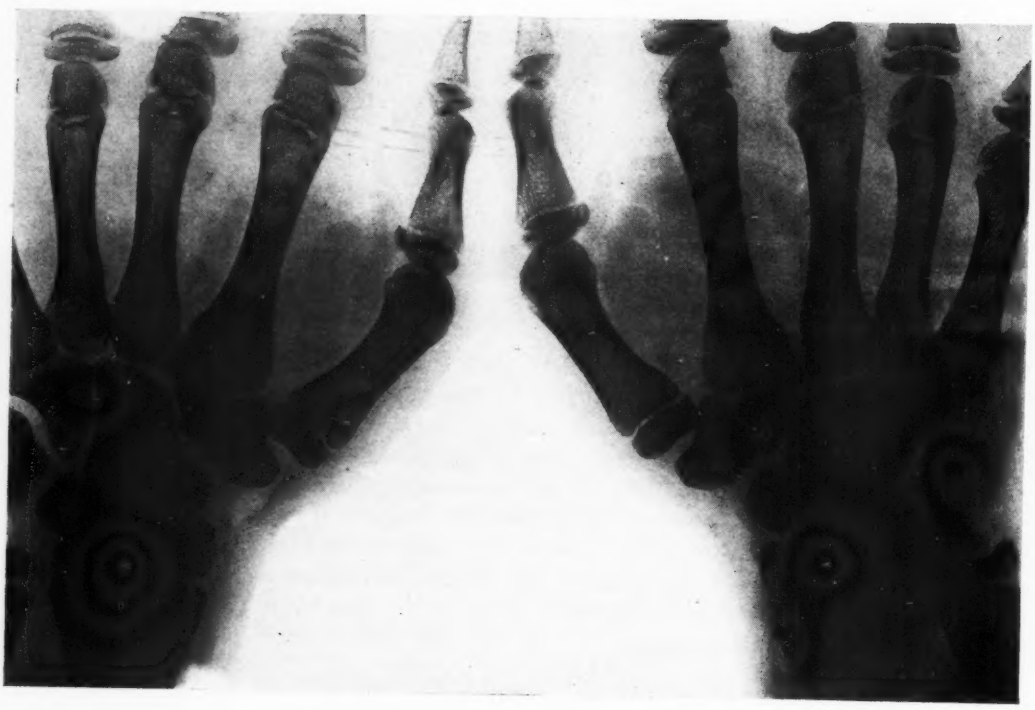


Fig. 4.

This is a case of such an extreme nature that it is only self-evident that the extreme disproportions between the development of the teeth and skeleton show a severe dysfunction so far as distribution of hard structural substance is concerned. It offers proof to the fact that in many lesser cases there may be disharmony or disproportion in the volume of tooth substance as adapted to the balance of the organism, which will naturally defy all idealistic efforts toward the perfect alignment of the teeth.

Dr. John V. Mershon, Philadelphia, Pa.—It certainly gives me a great deal of pleasure, as much as I dislike discussing papers, to discuss this masterly paper of Dr. Howard's. I hope that all the rest of you have been as thoroughly impressed as I have with what rule-of-thumb orthodontists we have been.

I am not a good student of the literature, but so far as I can recall, this is the first study that has been made in which an application of the correlation of the rest of the human organism to our work has ever been made in a way that we can apply it, and Dr. Howard, I certainly want to offer my congratulations.

There are just three points I wish to emphasize. First, is for that group of men who have been advocating early treatment to observe what Dr. Howard has pointed out to you. Second, that at times when we are treating with orthodontic appliances we are either doing no good or probably doing harm. The third thing is that Dr. Howard has very forcefully shown—and I hope he will take it up in his closing discussion—that you cannot finish a case at any time that you see fit; that the time that orthodontic cases will be finished is determined by the human organism and not by the dental arch alone.

Dr. A. H. Ketcham, Denver, Colo.—I cannot speak in words of too high praise of Dr. Howard's presentation and the discussions which we have heard.

No doubt each of us has been reminded through the pictures which Dr. Howard has shown of patients who have not responded to our treatment.

Dr. Howard spoke of a St. Louis school for boys in which periods of growth were shown to be most active between the months of October and June. Perhaps this is not a fair comparison for the reason that the boys are in a private school, presumably under better supervision than during the summer months when at home. If during the summer months they had been in Pollock's camp out in Colorado, or some other camp, under correct supervision, is it not fair to assume that the growth during the summer months might have exceeded that during the winter? A case in point: one of our young girl patients who lived at home during the winter made a gain of 13 pounds during 10 weeks spent at a carefully managed girl's camp in our mountains. The twelve girls at the camp made an average gain of 11 pounds each.

Dr. Howard's investigation shows us that we must do more than study the malocclusion of the teeth and the malformation of the faces of our patients, if we are to secure the best results, that we must have a thorough physical diagnosis which will include the skeletal structure.

Some orthodontists are studying through blood analysis the calcium-phosphorus ratio of the blood of their patients. Little is known about the significance of the calcium-phosphorus ratio, yet it is possible that much may be learned through the cooperation of orthodontists. I believe that along with the study of the skeletal development and the endocrine glands, we should include a study of the calcium-phosphorus ratio of the blood.

Another thought—are we helpless, can we do nothing if we find that our patients are retarded? I believe that we shall discover methods through cooperation with the internists and the general diagnosticians which will enable us to accelerate retarded growth.

Dr. Martin Dewey, New York City.—I want to compliment Dr. Howard very highly on the wonderful paper he has presented.

The paper was very wonderfully presented and it is one of the best presentations I have ever heard regarding the value of the forces of occlusion. (Laughter.) For him to tell you that the forces of occlusion have been overestimated only shows that he forgets that the first force of occlusion is cell metabolism. He has given you a wonderful study of growth

and beyond a question of a doubt, the relation between the development of the skeleton and a great many malocclusions cannot be overestimated. The malocclusion which Dr. Eby showed you is simply one of abnormal development in which cell metabolism has gone wrong. The malposition of those teeth, centrals, laterals, and premolars, corresponds exactly to the same position those teeth occupy in their crypts. They occupy those positions over a longer period of time than is normal because constitutional and skeletal development has not taken place to carry those teeth into a proper position.

Along with the suggestions dropped by Dr. Ketcham, I do not want you to become discouraged in regard to mechanical stimulation of bone. Bone can be stimulated mechanically. It is one kind of acceleration and yesterday you had a paper by Dr. Abbott in which he showed the lengthening of long bone by mechanical interference. You cannot laugh that aside because he actually lengthened those bones mechanically.

Also there was another statement made by my friend, Dr. Howard, which I think is not scientifically correct. He says bone will not grow unless inherent growth is present. That is partly correct and partly incorrect; in fact, in one of his other papers he proves the incorrectness of that statement when he calls attention to the fact that a certain group of investigators, by feeding pituitary extract to rats, developed them into giants. They were not inherent giants and had not inherited that physique from their ancestors, but an overdevelopment of that bone was produced beyond inherent size.

Dr. Samuel J. Lewis, Detroit, Mich.—I want to congratulate Dr. Howard on this most interesting paper and the vast amount of work he has done. I think this problem is extremely interesting not only to those who are doing research on growth of the dental apparatus, but to everyone practicing orthodontia. However, I do not feel as enthusiastic about it as Dr. Howard does, and I will tell you why.

A year ago I had a long talk with Dr. Howard in reference to the work he was doing down in Atlanta, and I told him of the work Dr. Lehman and I were doing in Detroit at the Merrill-Palmer School. We are making hand and knee radiograms of all our children between the ages of thirty months and five years, at intervals of one year. Besides these we have models of the teeth and dental arches of each child taken at yearly intervals, and it is from these that we will make our correlative studies. At first I was very enthusiastic and felt quite sure that we would be able to establish a positive correlation between the development of the dental arches and the carpal bones. However, my hopes were soon blasted when Dr. T. Wingate Todd told me that he had discovered nature didn't care particularly what happened to the carpal bones, but did care what happened to the epiphyses. In other words in his opinion, backed up by years of careful study and observation, little would result from a correlative study of the carpal development.

I don't question that there is a great deal we can learn from studies such as Dr. Howard has presented to us, and in spite of what Dr. Todd told us, we are going right ahead with our study regardless of whether we find a positive or negative correlation; negative correlations often being even more important from a scientific standpoint than positive ones.

Recently I had occasion to go over a few cases at the Merrill-Palmer School, and I was particularly interested in a case of fraternal twins: a boy and a girl. Eddie and Edna entered the school at the age of 26 months. At this time Eddie's bone age was 24 months, and Edna's 18 months. At the age of 39 months, Eddie's bone age was still 24, and Edna's 18. At the age of 51 months, Eddie's bone age was 39 months, while Edna's was 57 months. At the age of 56 months, Edna's bone age had climbed to 75 months, while Eddie's still stood at 39. The environment and diet was practically the same for both these children. Now, how do we account for this apparent discrepancy? Pryor says that variation in the growth of the bones of the hand is a heritable trait.

During this great variation in the growth of the carpal bones, what happened to the teeth and dental arches? We have successive models of these children's dental arches, taken a year apart, from the ages of 30 months to five years. Eddie, whose bone age remained stationary after 39 months of age, showed a Bogue measurement of 29 mm. at 30 months, 29.5 mm. at 38 months, and 30 mm. at 52 months. The width between the points of the

upper deciduous canines measured 33.5 mm., and remained practically the same during the three years he was under observation. Edna, on the other hand, started at 30 months with a Bogue measurement of 29.5 mm., at the end of the 52nd month, it was the same. Eddie, whose bone age remained stationary, showed an increase in the width of the upper arch, while Edna, whose bone age increased in such large proportions, showed no change in the width of the arch whatsoever. In the last examination of these twins, Eddie, who shows a retarded growth of the carpal bones, is losing his deciduous teeth and erupting his permanent incisors, while Edna, who showed an enormous carpal growth, shows no signs of losing her deciduous teeth. I mention this case because it is interesting from this standpoint: it is an excellent example of a negative correlation between the growth of the dental arches and carpal growth.

Dr. B. W. Weinberger, New York City.—It is impossible for me to attempt to discuss Dr. Howard's masterly paper. It is the type of paper that requires hours of thought and careful reading, and one I know Dr. Howard would not care to have discussed off hand.

There is one important point brought out by Dr. Howard that Dr. Ketcham emphasized, and that is the question of the time of development of children and treatment.

Here seems the possibility of a difference of opinion, which may be due to the varied locations. Whether St. Louis and the West has anything to do with this difference I do not know, but it has been my experience that the greatest increase in height and weight of children is during the summer months, and especially under camp supervision.

For the last ten years I have removed all possible appliance, especially active ones, during the summer months, when the children are ready to leave for camps, and to take the heights and weights of every child in May and October.

Now if Dr. Howard is trying to point out the necessity of treatment during this growth period and that is the time to put on appliances, we have here a difficulty that will then interfere with proper treatment. We are not able properly to handle the children during these months, except in camp.

Whether it is the removal of the appliances during the time of summer freedom and recreation, allowing nature a period of rest which results in a general stimulation and growth of my patients while at camp, or whether this growth, during the summer months is a universal condition found by others in my locality, I am unable to state. I do know, however, that during these four months their growth is equal to, or greater than, during the other eight months.

I am now merely calling attention to this fact that there might be a variance in the period of development and seasonal time in the different sections of the United States.

Dr. Howard.—Due to certain remarks made by some of my discussors, I regret that the paper was not first read by them. A misunderstanding of facts as found might have been avoided.

Dr. Woodbury, the assigned leader of the discussion, had the paper for his critical analysis several weeks in advance. His characteristic manner of logically analyzing values in correlated subjects prompts my sincere thanks to him for the thoughts he has advanced.

He, as well as another, inquired concerning observations in practice which related to general growth and arch growth. In short, we are convinced that cases presenting a growth problem of the jaws and arches show the greatest response to mechanical stimulation during a period of acceleration in skeletal growth. The few cases representing an individual study, some showing advancement and others no advancement in hand bone growth, though very suggestive in their value as an index to general growth, the number studied up to the present is entirely too small to arrive at definite conclusions. A study of such manifestations upon the individual child (not a group study) over a period of years should establish a definite value of hand bone progress as an index to jaw bone progress.

Dr. Eby's case, so well worked up, lends further encouragement to the value of correlated study. It was pleasing to learn that Dr. Eby was inquiring beyond our local field of operation. The points of disharmony in general growth to tooth pattern, as were demonstrated by him, very closely parallel a number of similar cases which we have studied

at The Good Samaritan (Endocrine) Clinic in Atlanta. The carpal group of bones of Dr. Eby's case resembles a twelve-year male hand rather than a sixteen-year-old boy.

I was surprised to hear Dr. Lewis quote Professor T. Wingate Todd to the effect that nature cared nothing about the growth of the eight carpal bones. Our study certainly does not substantiate such a charge. Reversely, we show no greater variability in the growth of this group of bones than would be normally expected. Dr. Lewis' other remarks, which concerned the relative rates of speed of growth of the hand bones and dental arches and jaws, were interesting. His small amount of material (one set of twins) was entirely inadequate to arrive at conclusions. In living organisms 100 per cent constancy of co-related qualities is never found.

Dr. Dewey's evaluation of the "forces of occlusion" as paramount factors in determining the growth of the jaws is placed at too high a rating. He says that, "I forget that the first force of occlusion is cell metabolism." I deny such forgetfulness, I even remember that both he and Angle explain "cell metabolism" as mechanically influencing the crown of a tooth to erupt into occlusion by building root tissue and causing an upward pressure upon the crown.

I am glad Dr. Dewey's timidity prevented an attempt to explain the other five forces of occlusion, namely, incline planes, contact point, muscular pressure, harmony in size of arches and atmospheric pressure, as being biologic and not mechanical. Observations disprove the magnified importance of these "forces" as analyzed by both Dewey and Angle. Many cases can be shown with complete distal occlusions and also presenting well-grown mandibles. Also cases, with normal mesiodistal relations of the teeth that have arrested growth of the mandible. I have been, on another occasion, accused by Dr. Dewey of "throwing the forces of occlusion out of the window." If the orthodontic problem begins and ends with mechanics, these six "commandments" should be preserved. If not they should be given a place in orthodontic conception of relatively small importance as far as their influence upon the growth of the jaws is concerned. Dr. Dewey says I disprove the importance of inherent growth by my own reference to Evans' work. He produced gigantism in rats by feeding anterior-lobe substance. The illustration remains entirely applicable. The construction and interpretation of the word "inherent" is by no means the same as the word "inherit."

His proof of the potency of mechanical pressure in causing bone to grow as attempted by his calling attention to Dr. Abbott's paper on yesterday is quite consistent with his other explanations. As a matter of fact Dr. Abbott lengthened the bone with a chisel and a saw. In the vernacular words of Dr. Dewey "Laugh that off."

Dr. Mershon is indisputably correct when he states that the inherent properties of growth are the determining factors in the completion of a growth problem of malocclusion. We sometimes see in print the most bizarre statements concerning the completion of certain cases in a matter of a few weeks. Only the most sophomoric concepts of our problem could prompt such claims.

I wish to publicly acknowledge my sincere thanks to Dr. Mershon for his contributions in practically applying the laws of biology to the deeper problems of malocclusion. Orthodontia owes him a lasting debt of gratitude. The other three gentlemen who took part in this discussion I am indebted to for they added encouragement to further efforts in correlated study.

COMMENTS UPON THE RELATIONS OF THE WORK OF THE ORTHODONTIC SPECIALIST TO THAT OF THE GENERAL MEDICAL PRACTITIONER*

By Lewellys F. Barker, M.D., Baltimore

THAT the orthodontic specialist can do much, and does do much, to overcome and to prevent malocclusion of the teeth, to improve the facial appearance of his patients, and to prevent the development of diseases of the teeth, of the jaws and of the neighboring structures in the head, is well known to those of us who work in general medicine, though most of us must confess to profound ignorance of the details of orthodontic diagnosis and to gross unfamiliarity with the precise methods of anchorage, regulation, and retention that are employed in cure and in prevention. For example, I doubt if one general medical practitioner in a hundred could tell you the relations of the inclined planes of the cusps of the individual teeth, could describe even the principal forces that are operative in dental occlusion, or could enumerate the several possible positions of malocclusion of any individual tooth. Most of us, if asked what is meant by mesio-labial-torsi-infra-occlusion would, I fear, get a zero mark on the examination. If you were to ask me whether or not the relation of the mesiobuccal cusp of my own maxillary first molar to the buccal groove is normal, I should have to admit that I do not know, though I hope it is!

And just as we who practice medicine have but a limited knowledge of the orthodontic specialty, so, also, there are, I imagine, many orthodontists who wish that they knew more about the preclinical and the clinical medical sciences in as far as they have a bearing upon their subject. Not every orthodontist possesses, I feel sure, all the information he would like regarding the influences of genotypic (or hereditary) factors on the one hand and of paratypic (or environmental) factors on the other upon normal and abnormal dental occlusion. The preclinical sciences of biology, biophysics, biochemistry, anatomy, physiology and pathology as well as the clinical sciences of medicine, surgery, rhinology, neurology and endocrinology are all capable of throwing more or less light upon the special domain in which you are interested. In both the diagnosis and the treatment of patients there is need of close cooperation between orthodontists and medical practitioners; each group may call the attention of the other group to the existence of important conditions that might otherwise be overlooked, and, not infrequently, there should be collaboration of members of the two groups in the carrying out of curative and of preventive measures. These, I take it, are the facts that you desired me to emphasize when you so courteously invited me to speak to you briefly upon this occasion.

*Read at the Annual Meeting of the Southern Society of Orthodontists, April 28, 1928.

The orthodontist making his preliminary survey of the mouth often encounters conditions that he recognizes should be promptly referred to a physician for study and treatment; and the closely observant physician will frequently detect oral and other cephalic states that clamor for orthodontic aid. Perhaps the closest relationship should exist between the specialist in diseases of children and the orthodontic specialist; for it is in the earliest years of life that orthodontists must intervene if the results of their work are to be satisfactory. And in his studies of malocclusion (actual or potential) the alert orthodontist will frequently feel the need of the counsel and help of some one who is familiar with the management of certain constitutional and situational factors that may play a part in the origin either of faulty occlusion or of pathologic processes in teeth, the maxillae, the mandible, the tongue or other structures.

STUDIES OF ETIOLOGY

All abnormalities of the human body have their source either in faulty germ plasm or in faulty environmental influences—most often in both. The potentialities of development lie in the germ plasm; the actualities of development are the results of the interaction of environmental influences with the germ plasm. As Roux put it, heredity supplies the "determining" factors; environment supplies the "realizing" factors. Genotype and paratype combined yield the phenotype or realized person.

In looking over recent orthodontic literature, I am impressed with the fact that there is relatively little interest in factors of heredity as causes in comparison with the tremendous interest manifested in factors of the environment. That is perhaps natural when we recall the general impression (which I believe to be erroneous) that emphasis upon causal heredity leads to pessimism in therapy and that emphasis upon causal environment leads to optimism in therapy. But we should never be afraid to face reality; if heredity is important in etiology, nothing is to be gained and much will be lost by adopting an ostrich-like attitude toward the facts. Recent researches in medicine have been demonstrating more clearly than ever before the dispositions to abnormality and to disease that are inherited and the better medical thought of our time is sympathetic with the view that therapists who ignore the inherited tendencies of the constitution must in the long run be less successful than those who endeavor to detect them and to utilize the knowledge thus gained for finding suitable environmental influences that may be employed as remedies or as preventive measures. It is this clearer insight that accounts for the revival of studies of constitution now undertaken by medical investigators and for the establishment in some of our better medical schools and hospitals of so-called "constitution clinics." I cannot but believe firmly that studies of constitution will in time prove to be as helpful to orthodontic specialists as they are coming to be to students of other special domains.

Moreover, it should not be forgotten that nervous influences, endocrine influences, and metabolic influences depend, in the last analysis, fully as much upon genotypic as they do upon paratypic factors. We must, of course, in

the study of families, consider the situations in which the families have lived as well as the chromosomal tendencies that those families transmit; but different families in the same environmental situation exhibit differences in development and in disposition to disease that can be accounted for only by definite differences in germ-plasm constitution. Even in your studies of the forces of occlusion and the effects that they produce, you should, I think, remember that hereditary factors are largely determinative not only of the cell metabolism of the tissues immediately concerned in the development of the teeth but also of the cell metabolism of all the structures of the head, as well as that of the nervous system and of the endocrine system, systems which though far removed from the teeth and jaws exert a profound influence upon the character and the rate of the development of the latter.

In your etiologic studies you pay attention, and rightly so, to the influence of general constitutional diseases like rickets, abnormalities of the lymphatic apparatus (especially of the tonsils and adenoid tissue), endocrine disorders, nervous diseases, and infections like syphilis and tuberculosis. You are right too, it seems to me, in studying the effects of dietetic deficiencies and particularly of vitamine deficiencies upon the structures in which you are interested. And you are, apparently, learning much about the influence of faulty habits such as thumb and finger sucking, tics of the tongue, lip and cheek biting, abnormal movements of the lips and cheeks, and abnormal postures assumed either during sleep or while awake—all of which appear to be of importance both for knowledge of etiology and for the devising of appropriate plans for cure and for prevention.

MORPHOLOGY AND PHYSIOLOGY OF THE LOWER FACE AND OF THE ORAL AND NASAL CAVITIES

It needs only a glance at the literature of your subject to convince one that students in your domain are doing much work that tends to throw new light upon the morphology and the physiology of the jaws and of the cavities of the nose, throat and mouth. Your discussions, for example, of the possible relations of mouth breathing to malocclusion seem to me most interesting. It would appear that some of you look upon mouth breathing as a common primary cause of malocclusion; whereas others of you regard malocclusion as the primary cause of faulty development of the oral and nasal cavities and of the accessory nasal sinuses, as well as of the jaws. I gather that the only thing actually settled as yet is that most important reciprocal relations exist here; but as yet, it does not seem always possible to determine in how far one factor is primary and in how far it is secondary. Some of you believe that faults of mastication and of deglutition may often be responsible for malocclusion; whereas others, in turn, maintain that malocclusion is in large part responsible for faulty mastication and deglutition. Again, I gather that there are differences of opinion among you as to the precise relations of maxillary and mandibular development to malocclusion. Such clashes of opinion excite to research. If there were agreement on all points there would be stagnation

of investigative work. New discoveries come because of conflict of views; if there were no conflict of opinion there would, as everyone knows, be but little research activity. Let us welcome, therefore, strongly opposing views because of their heuristic value!

ENDOCRINE DISTURBANCES AND MALOCCLUSION

I am glad to note the interest exhibited in the possible relations of endocrinology to the orthodontic specialty. Undoubtedly, hypothyroidism is frequently associated with delayed eruption and with malposition of the teeth. Undoubtedly, hypoparathyroidism leads to faulty calcium metabolism and to enamel defects. Undoubtedly, too, overactivity of the pituitary gland can lead to excessive development of the mandible, to abnormal spacing of the teeth and, accordingly, to disturbance of approximal contact. We shall, in time, probably discover many other relations of the functions of the endocrine apparatus to the development of the teeth and the jaws. Some interesting observations have already been made upon the teeth in precocious development on the one hand and in retarded general development on the other. Instances in which the physical skeleton is that of a twelve-year-old child have been described in which the dental condition was that of a three-year-old child. There are some who are of the opinion that dental conditions are a better guide to the chronologic age of the patient than are general skeletal conditions. I feel sure that the future must have much in store for your specialty to follow upon studies of the correlation of general development of the body with development of the teeth and jaws.

METABOLIC AND VITAMINE STUDIES IN MALOCCLUSION

Now that we know that rickets, scurvy and disposition to infection are related to deficiency in one or another vitamine, orthodontists are compelled to be interested in the relations of the newer vitamine studies to their specialty. This would seem to be particularly true of rickets, a disease in which there are profound disturbances, not only of the growth of the bones of the jaws but also in the growth of the teeth and of their enamel organs. Studies of the blood for its content in calcium and in phosphorus and careful inquiries into the vitamine content of the diet are, along with x-ray studies, of value in diagnosis.

Whether or not infections like syphilis and tuberculosis exert their malign influences upon the teeth directly, or indirectly through the intervention of nervous, endocrine or vitamine influences, we do not yet know; but your examinations of the teeth and of the oral structures may often excite suspicion as to the existence of one of these diseases and permit you to call the attention of the family physician to the possibility. Thus the dentist may be the first to observe the converging crown and the notched enamel defect of the permanent maxillary central incisors known as Hutchinson's teeth, or the peculiar dome-shaped first permanent molar teeth known as "Moon's molars"; he will, of course, suspect the existence of congenital syphilis and should report his suspicion to the family physician who will examine further for bosses

on the skull, for interstitial keratitis and for other signs of congenital syphilis seeking verification or refutation of the suspicion also by means of the Wassermann reaction.

Interesting metabolic disturbances, there are, too, that might go unrecognized except for a general dental survey. I need only mention the greenish discoloration of teeth met with in children who have been jaundiced, or the pink discoloration of teeth observable in familial haematoporphyrinuria.

RELATIONS OF THE NERVOUS SYSTEM TO ORTHODONTIA

Before closing these desultory remarks upon the relations of general medicine to the orthodontic specialty, I desire to refer again to the importance of the studies of the nervous system in patients who suffer from malocclusion and from the facial deformities that may accompany it. I have already referred to the various nervous habits that may accompany and in part be responsible for malocclusion. These habits are often due to faulty training of children by their parents; but, in most cases, in addition to the faulty training, there is a neurotic constitution that needs medical care and supervision.

But there is another side of this topic of the relations of the nervous system to your work that I would like to emphasize and that is this: the disfigurements that accompany the severer forms of malocclusion are often a source of great mortification to those that exhibit them. No person enjoys the possession of malformed dental arches, of a short lip, of a receding chin, or of an "Andy Gump" countenance. Only too often in such persons an inferiority complex may develop, which if not understood and combated may go far toward influencing deleteriously the whole affective-conative life of the patient. Orthodontists are, in my opinion, performing a great service in correcting and preventing facial disfigurements and through such work they go far toward aborting certain disorders of the nervous system of the type just mentioned. But in cases that are not early and thoroughly treated, a certain amount of disfigurement is likely to be permanent, in which event the orthodontist may desire to call to his aid the neurologic specialist to help him to combat a developing "inferiority complex" or the over-compensations that tend to result from it.

Finally, from esthetic considerations alone, medicine must be grateful to the orthodontic specialty for the happy results its practitioners are obtaining in the prevention of deformity and ugliness. The public cannot be too quickly or too earnestly educated to the significance of this esthetic side of the orthodontist's work.

I have, I fear, already talked too long upon a subject that readily excites one's interest in many ways. I hope I have made it clear that we who work in medicine cannot fail to be deeply concerned with the problems with which you deal and very grateful for the tasks that you perform. There should and will be, I believe, an ever increasingly cordial relationship between your profession and ours.

THE USE OF COIL SPRINGS IN ORTHODONTIA (CLINIC)*

By Dr. E. B. Arnold, Houston, Texas

I HAVE been endeavoring for some time to construct an appliance with which the anchor teeth (point of attachment) could be moved by the same delicate physiologic application of pressure that we have in the movement of teeth anterior to the anchor teeth by the use of the 0.020 finger springs.

Of course, I do not wish to convey the thought that these appliances can

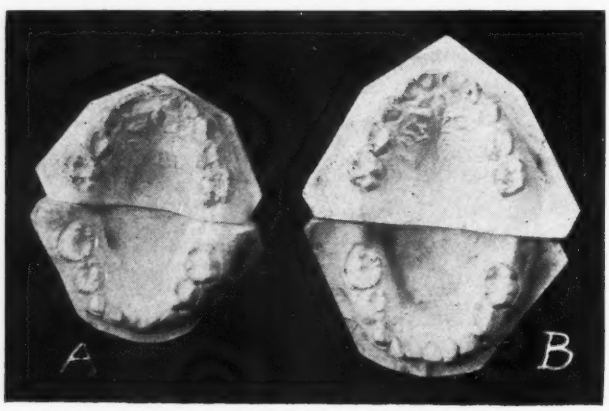


Fig. 1.

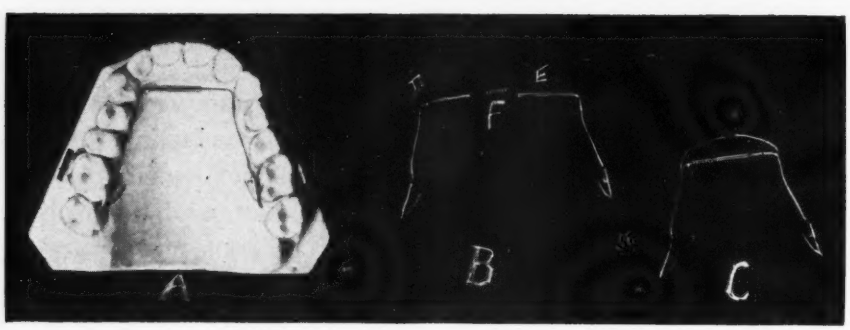


Fig. 2.—*D*. 0.022 wire soldered around arch wire to act as stop for spring. *E*. 0.040 round tube. *F*. 0.010 coil spring.

be used on every case, but they have their places I think in a large number of cases.

Fig. 1-*A* shows a case of a boy six years old with anterior deciduous teeth crowded. Fig. 1-*B* shows a girl five and one-half years old with the same condition. In the lower arch the two deciduous centrals have been lost and there is only room to accommodate one permanent central incisor. The development of these arches seems to be at a stasis or at least they are not developing as they should. The radiogram showed the anterior permanent

*Read before the First International Orthodontic Congress.

teeth to be rather large, and orthodontic interference seemed inevitable. You will note that the arches have a very good shape but seem to need an equilateral development; by this I mean that the molars need as much expansion as the canines and anterior teeth.

In the above class of cases the appliances shown in Figs. 2-*A* and 2-*B* seem to be ideal as we have the same delicate pressure on the anchor teeth that we have on the rest of the mouth. The teeth move bodily, that is, there is no tipping and the teeth remain in the same occlusion and function during movement. There is no trouble in keeping the appliance in its correct position and another very good feature is that the two-piece appliance gets away from the rigid attachment or holding of molars that we have in the usual one-

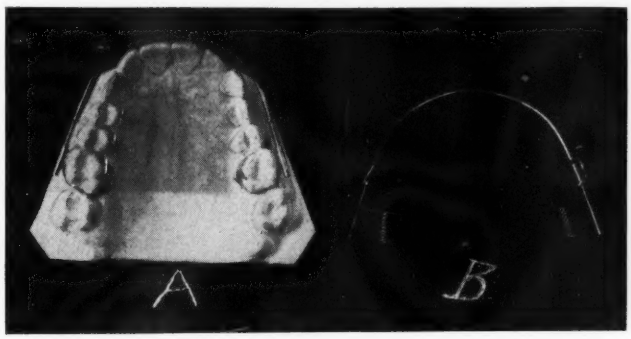


Fig. 3.

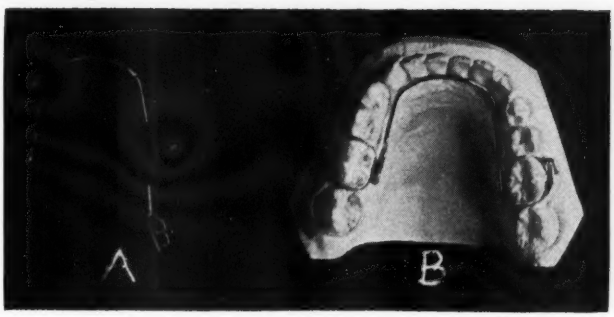


Fig. 4.

piece lingual arch. Of course, like in any other appliance one must be careful in the application of pressure as to the amount of frequency of adjusting. At no time do I attempt to open the coil springs more than one and one-half millimeters and I do not do this oftener than every six to eight weeks. After I have accomplished a little lateral development then I attach 0.020 finger springs, as shown in Fig. 2-*C* for the labial movement of the anterior teeth if this movement is desired.

(NOTE.—The models on which these appliances are constructed are technic models and not practical ones.)

Figs. 3-*A* and 3-*B* show a labial arch with coil springs which can be used in cases in which we wish to use a labial appliance for the anterior movement of the anterior teeth. This appliance can also be used for posterior movement

of molars by the use of intermaxillary rubbers to reinforce the anterior teeth. This is accomplished by the usual method of attaching rubbers from hooks at the canine region of the maxillary arch to hooks on the mandibular molar bands, using a lingual arch for anchorage. Where we wish a movement of molar on one side, we, of course, only use a spring on that side.

Figs. 4-*A* and 4-*B* show an appliance that can be used in unilateral distoclusion, using the spring on the side that is normal. The spring is either going to move distally the molar that is normal, or the opposite molar, and teeth anterior to it, mesially. By the use of intermaxillary rubbers on both

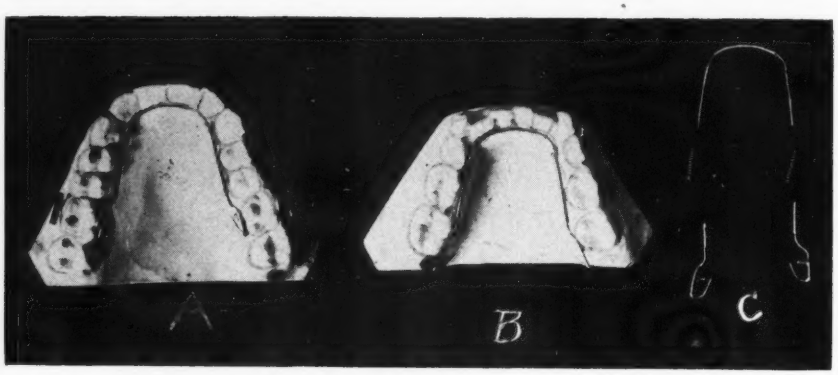


Fig. 5.

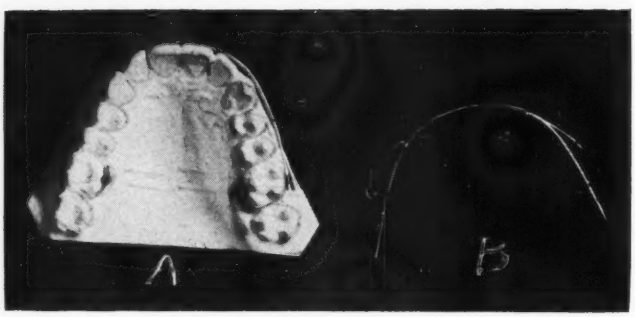


Fig. 6.

sides we prevent a distal movement of the normal molar and cause a mesial movement of the opposite molar.

Figs. 5-*A*, 5-*B*, 5-*C*, illustrate an appliance that can be used to get anterior movement of anterior teeth after lateral expansion has been accomplished. Care must be exercised to get the tubes as parallel as possible, otherwise it may cause a lateral movement or a locking of the tubes. In using this appliance I always construct it in a nice round curve that is indicated for the case (Fig. 5-*B*) even though it touched but one anterior tooth (the one most lingual). As pressure is applied the anterior part of the appliance moves forward with the teeth and in time is touching all the anterior teeth, having rotated those that needed rotating. In some cases it may be necessary to use intermaxillary anchorage to reinforce anchor teeth but if application of pressure is delicate and slow, this is not necessary.

Figs. 6-*A* and 6-*B* show a labial appliance which may be used for distal movement of anterior teeth or mesial movement of molars. Intermaxillary anchorage to be used accordingly. The lock on this particular appliance consists of a small sliding tube (1½ mm. long) to which an 0.022 wire is soldered and hooks at distal of tube on molar band.

For the springs I use 0.010 hard drawn wire, simply wrapping it on a piece of wire of the size that I am going to make my appliance of. I have been using 0.040 and 0.038 wire and tubes for my appliances, but a smaller size may be used if desired.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

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MAXILLOFACIAL PROSTHESIS*

By Roy L. Bodine, D.D.S., Washington, D. C.
Captain, Dental Corps, U. S. Army

(Continued from page 1010, November issue.)

DESIGNING FIXATION SPLINTS

THE experiences of the World War made such radical changes in the methods of treatment of jaw fractures that most of the appliances used prior to 1914 have become obsolete, although some have been retained in principle but greatly modified as to design and materials. The bulky, fragile, unsanitary Gunning vulcanite splint has little resemblance to the modern cast-metal splints, and has been abandoned except for edentulous cases; and while extraoral arms are still frequently used, they are attached to cranial anchorage for the retention of fractured maxillae instead of being held by submental bandages for fractured mandibles as in Kingsley's original scheme.

Swaged metal splints were first substituted for vulcanite, but the difficulty of construction led to such poor adaptation with consequent frequent loosening that they were later abandoned. Cast metal splints of low-fusing metals and subsequently of aluminum were extensively used, but the bulk necessary for strength and the difficulty of adding attachments were serious disadvantages. The splint which finally came into use was the cast jacket splint of some alloy of silver. It was used with increasing frequency, and in the reconstruction work in this country came to be the type used to the exclusion of all others.

Using the cast silver splint as a basis, all of the various types of appliances can be constructed. Its advantages are as follows: It has the necessary strength and rigidity, without undue bulk; it takes a high polish which facilitates cleansing; while it tarnishes in the mouth, it does not corrode, and

*From the Department of Prosthesis, Army Dental School, Washington, D. C.

the discoloration may be prevented by gold-plating, or is easily removed by the ordinary mouth hygiene methods; construction is simple, and any desired additions or modifications may be made by soldering without difficulty; cement adheres to it tenaciously, and retention is excellent.

The various designs of splints for each class of fracture will be taken up in detail, together with the indications for their use.

FRACTURES OF THE MANDIBLE

Class I. Teeth in Each Fragment.—In simple cases, splints may be indicated instead of wiring for any of the following reasons:

(a) Delayed union. If it is necessary to retain the fragments in position for several months, the patient will be much more comfortable with a splint which allows free movement of the mandible, and efficient mastication.

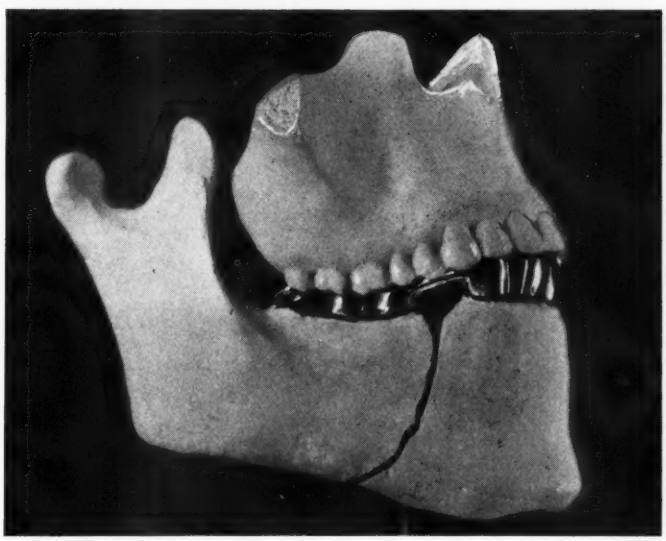

Fig. 15.—Splint for Class I fractures of the mandible. In some simple cases this cast silver jacket encapsulating only the mandibular teeth will provide sufficient retention.

(b) Fragile union. Owing to loss of substance or other reason, although solidification may be complete, the bone may not have sufficient strength to be allowed full function until further deposition of bone has occurred.

(c) Occupational or esthetic reasons may preclude retention by intermaxillary wiring and necessitate some appliance which will allow functional movement with possibly a prosthesis to improve appearance during the period of convalescence.

(d) Uncontrollable patient. Psychopathic patients will frequently tear off intermaxillary wires as fast as they are applied. A cemented splint affords a comfort and freedom which tends to correct the antagonistic attitude of the patient, and is practically impossible for the patient to remove.

In these simple cases, a cast jacket splint, encapsulating the teeth of the mandible only, and cemented to place, will provide all of the retention necessary (Fig. 15). During the later stages of treatment the mandible may be

used freely, the occlusal surface of the splint providing a fairly efficient masticating surface, and a prosthesis may be added in case it is required (Fig. 16).

In more involved cases, intermaxillary splinting may be necessary. Indications for this type of splint, as opposed to wiring are:

(a) Too few remaining teeth to provide anchorage for intermaxillary wires.

(b) Remaining teeth not firm enough, or not properly shaped or opposed for the use of wires.

(c) Preparation for surgical intervention, bone-grafting, etc.

(d) Uncontrollable patient.

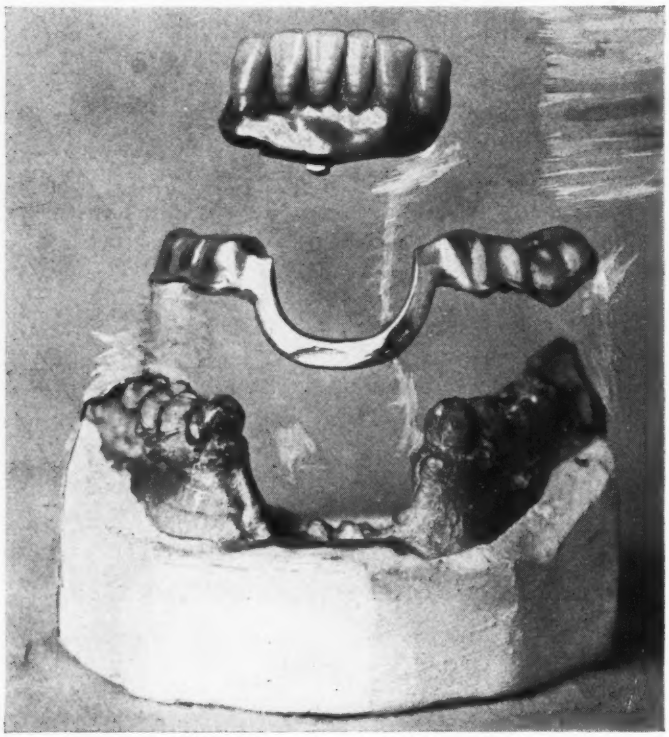

Fig. 16.—A prosthesis may be added for esthetic effect when indicated. (Bodine: Military Dent. Jour., Dec., 1921.)

These cases would require cast jacket splints, encapsulating both the mandibular and maxillary teeth, with interdigitating tubes attached in each buccal region for the reception of lock-pins (Fig. 17). These pins may be removed quickly in case of emesis; the removal of the pins allows free opening of the jaws for hygiene or exercise, and, if desired, in the later stages of treatment the maxillary jacket may be removed without interfering with the function of the mandibular jacket. If strength is not necessary in the intermaxillary relation, the maxillary anchorage may consist of orthodontic bands fitted to the first bicuspid and first molar on either side, with the interdigitating tubes attached to bars connecting the buccal surfaces of the bands. If Angle fracture-bands are used, the adjusting nuts of the bands are placed

to the lingual, allowing the connecting bars to be soldered to their buccal surfaces. It is not necessary for the two sides to be connected.

If only one tooth remains in a fragment, the best anchorage is secured from the single tooth by the use of an adjustable band, heavily reinforced with solder, and attached to the body of the splint by a heavy arm, either fixed or removable (Fig. 18).

Class II. Edentulous Posterior Fragment.—If there is no loss of substance, wiring, or an intermaxillary jacket splint with lock-pins, immobilizing the anterior fragment, will usually be all that is required, since the direction of muscle pull on the posterior fragment usually tends to make it self-retaining (Fig. 19). If, however, there is a tendency toward displacement, a vulcanite saddle should be constructed, with velum rubber margins and lining, covering the upper surface of the fragment and extending up the anterior

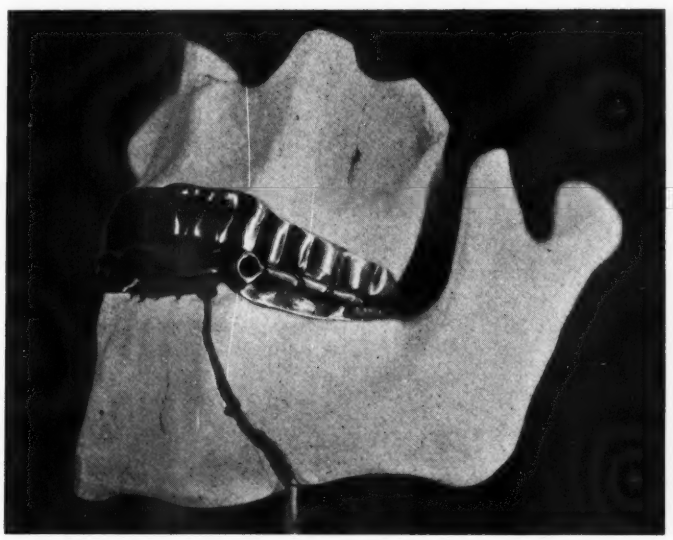

Fig. 17.—Splint for Class I fractures of the mandible. Involved cases require intermaxillary splints with lock-pins.

surface of the ramus as far as possible. This saddle is attached to the mandibular jacket by a bar, and connected to the maxillary jacket with lock-pins, so that the jaws may be opened without changing the relation of the fragments (Fig. 20).

In vertical fractures through the ramus, there frequently is a tendency toward buccal displacement of the posterior fragment. Since access to this area through the mouth is impossible, some form of extraoral anchorage is indicated. The simplest form consists of a pressure pad of unvulcanized rubber applied to the displaced fragment, attached to an orthopedic plaster headcap or other cranial anchorage by means of a heavy spring wire (Fig. 21). With the anterior fragment immobolized, this apparatus will give the slight retention needed.

In cases with loss of substance, control of the edentulous posterior fragment by means of intraoral saddles has proved rather unsatisfactory. The muscle pull on the freely movable fragment creates pressure upon the saddle

beyond the tolerance of mucous membrane. Some success has followed the use of pins attached to the maxillary splint, and bearing upon the anterior surface of the ramus through a slight incision in the mucosa. Extraoral anchorage gives greater promise of success. My method consists of a micrometer type of tongs, grasping the fragment through a slight incision under the angle of the jaw. The tongs are adjustably connected by means of a rigid bar which passes through the angle of the mouth to a cast jacket cemented to the anterior fragment (Figs. 22 and 23). The bar stands far enough away from the cheek to allow for dressings, and for possible edema, and is high enough not to interfere with a bone grafting operation from beneath. A cast jacket on the maxilla connected to the mandibular jacket with lock-pins immobilizes the mandible, yet will allow movement when desired in the later stages.

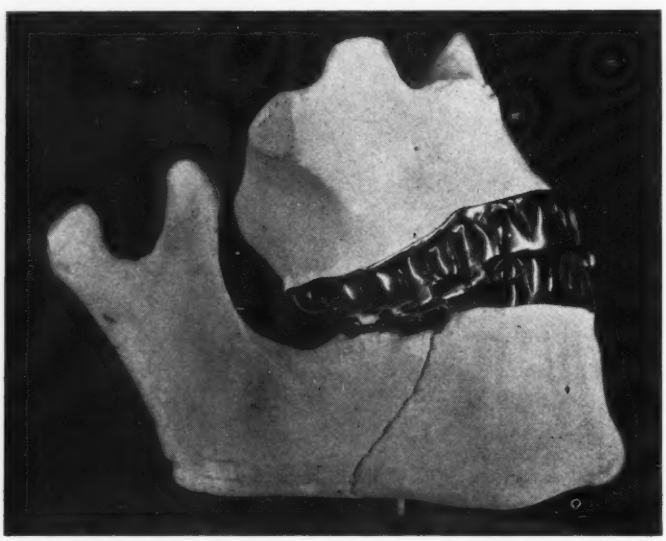

Fig. 18.—Splint for Class I fracture of the mandible. Adjustable band on the single tooth gives secure attachment.

Class III. Edentulous Cases.—If a denture has been worn, it may be used as a splint by drilling holes through the interproximal spaces for intermaxillary wires. Additional space for feeding may be provided if desired by sawing out a block of six anterior teeth, to be replaced afterward. If no denture is available, a vulcanite pseudodenture should be constructed with vulcanite blocks in the posterior region for occlusal relation, having indentations to fit the cusps of the upper teeth (Fig. 24). An orthopedic plaster headcap, connected to a plaster chincap by adjustable straps will retain the mandible in proper position (Fig. 25). Bandages may be used in simple cases, but are very unreliable on account of their tendency to stretch and loosen.

Circumferential wires, passing through or over the splint and then around the mandible are sometimes used, but are seldom necessary.

FRACTURES OF THE MAXILLA

Class I. Partial Fractures, Teeth in Each Fragment.—While it is possible to treat partial fractures of the maxilla by means of intermaxillary wiring, the movements of the mandible, which the patient involuntarily makes tend to delay the process of repair. A cast jacket splint encapsulating all

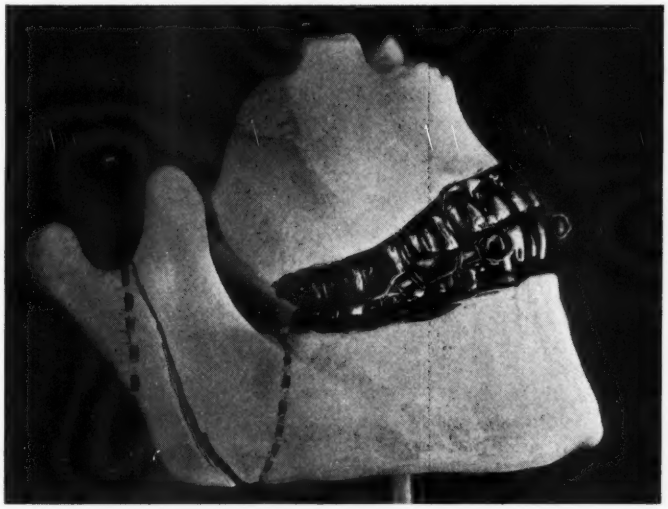

Fig. 19.—Splint for Class II fracture of the mandible. Self-retaining posterior fragment. Dotted lines indicate other frequent fractures.

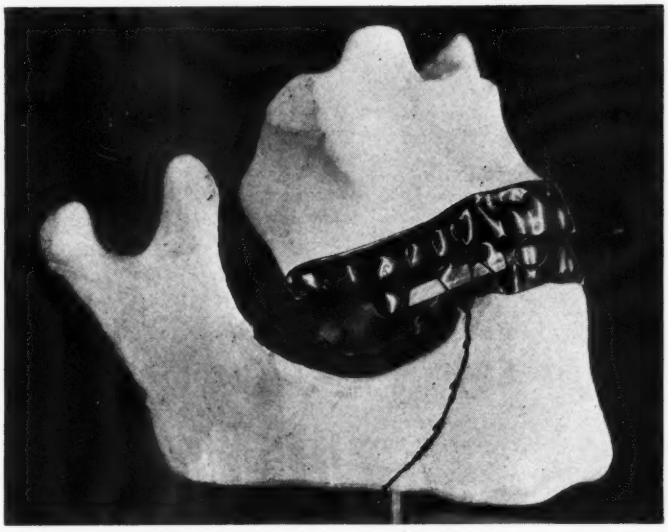

Fig. 20.—Splint for Class II fracture of the mandible, with velum lined vulcanite saddle to support the posterior fragment.

teeth in each fragment gives much better retention, and in addition allows full use of the mandible for mastication (Fig. 26). While it requires more time to construct the splint than to apply wires to the case, the saving in time necessary for after-treatment, such as tightening or replacing wires, more than compensates for it, to say nothing of the improved hygiene made possible by the splint.

Class II. Complete Fractures, Teeth in Each Fragment.—Wiring in complete fractures of the maxilla is contraindicated as the mandible is too freely movable to provide a satisfactory anchorage. Recourse must be had to some form of extraoral support, and cranial anchorage is the most available and efficacious.

A cast jacket splint should be constructed, encapsulating all of the maxillary teeth, and provided with oval tubes along the buccal region. Engaging in these tubes are oval wires, which emerge at the angles of the mouth and pass backward parallel to the cheeks, terminating in loops just back of and below the ears (Fig. 27). An orthopedic headcap, with two buckles set in its

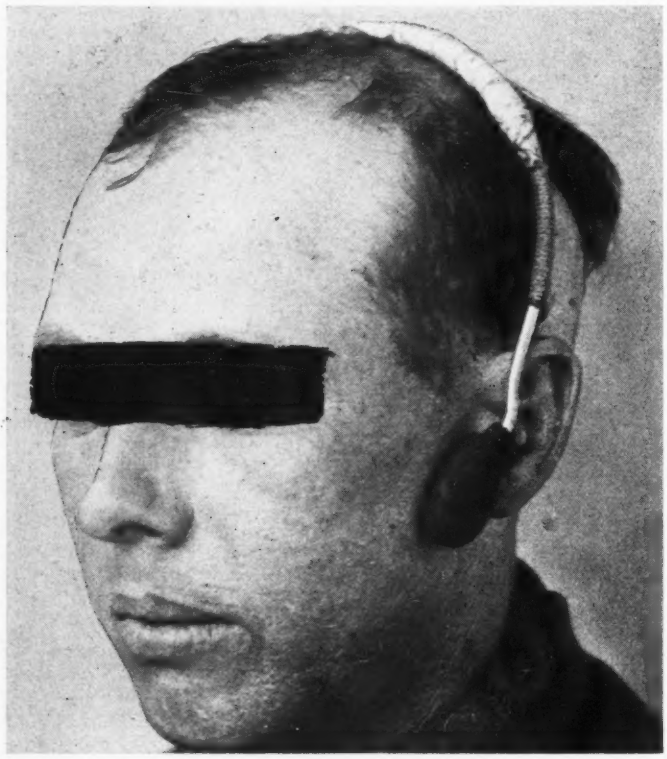

Fig. 21.—Extraoral pressure pad to prevent buccal displacement of the posterior fragment.

margin on either side, provides attachment for straps which engage in loops on the Kingsley arms, so placed that they will develop the correct directional pull on the detached fragment. One pair of straps will usually be placed as close to the eyes as possible without interfering with vision, and the other pair immediately in front of or just behind the ears (Fig. 28). Tape connecting the loops at the posterior ends of the extraoral arms and passing across the back of the neck, stabilizes the appliance and prevents accidental external stresses, such as pressure from the pillow upon which the patient is resting, from being transmitted to the fragment.

A mandibular splint is usually unnecessary.

Class III. Edentulous, Partial or Complete.—Using the denture previously worn, or constructing a pseudodenture for the purpose, tubes for the

Kingsley arms are embedded in the vulcanite in the buccal region (Fig. 29). The arms with headcap and straps are constructed in the same way as for all complete fractures of the maxilla as described above.

FRACTURES OF BOTH MANDIBLE AND MAXILLA

In cases of fractures of both jaws, each jaw should be classified separately and a splint constructed which would be a combination of those above de-

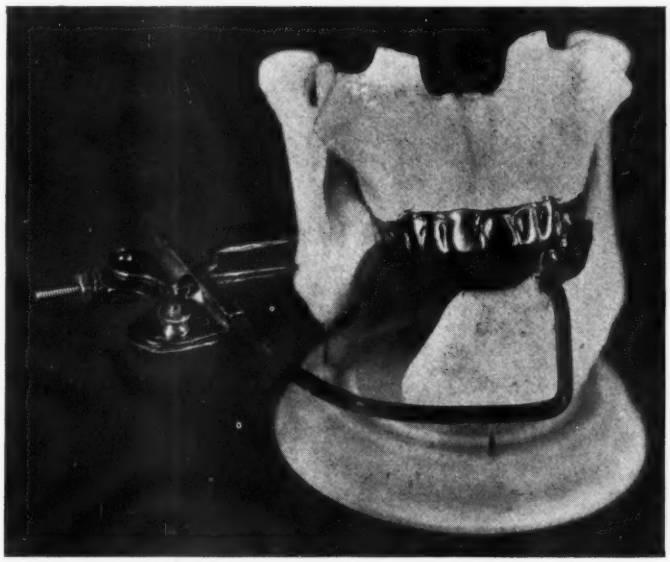

Fig. 22.—Author's "Micro-tongs" for extraoral control of edentulous posterior fragment. The tongs grasp the fragment through a slight incision at the angle, and allow adjustment in any direction.

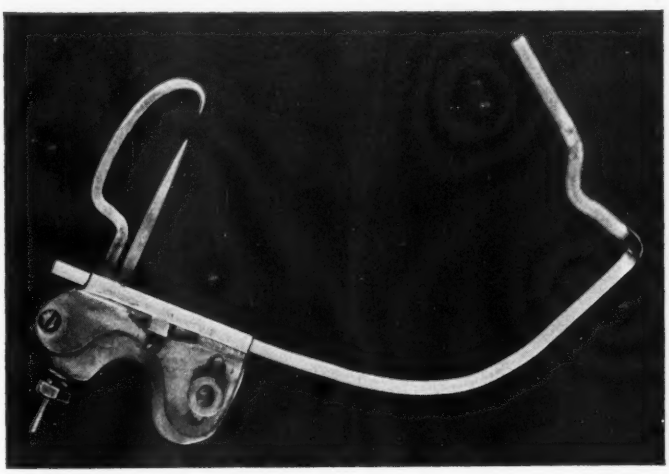

Fig. 23.—Extraoral arm showing design of "Micro-tongs."

scribed under the various classes. In some other cases, combination splints would also be indicated. For example in a case of fracture of the mandible, Class I or II, with an edentulous maxilla, the prescribed mandibular splint should be attached with lock-pins to a maxillary splint constructed as described for Class III maxillary fractures.

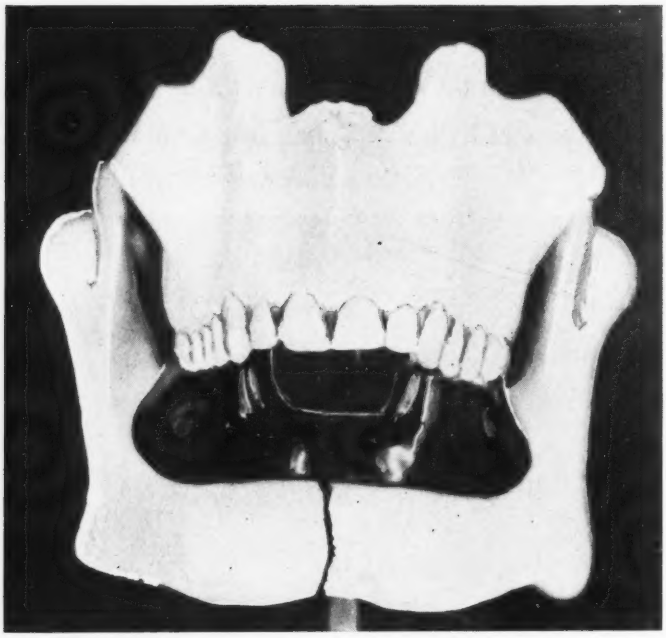

Fig. 24.—Vulcanite splint for Class III fractures of the mandible.

Fig. 25.—Orthopedic head- and chincap, with adjustable straps, used in connection with the splint for Class III fractures of the mandible. (Bodine: Military Dent. Jour., Dec., 1921.)

SECTIONAL SPLINTS

Sectional splints are indicated when it is difficult or impossible to reduce the fracture and cement the splint simultaneously because of:

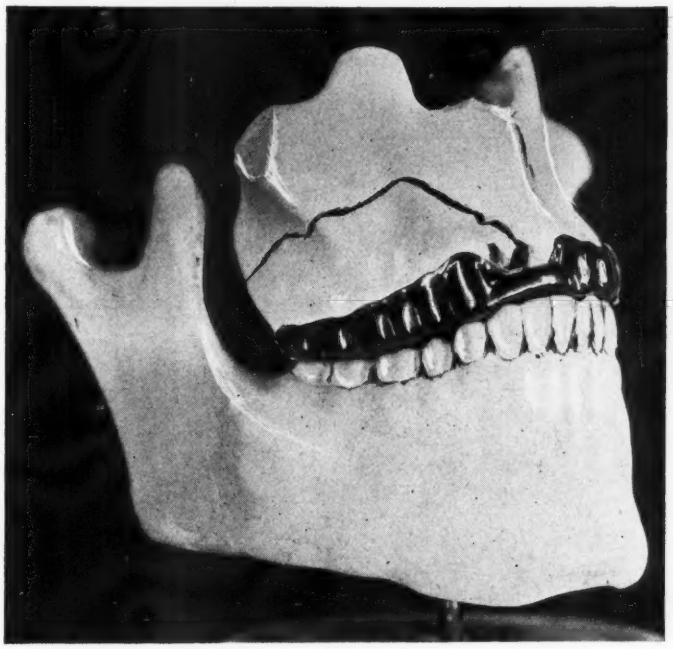

Fig. 26.—Splint for Class I (partial) fractures of the maxilla. The cast silver jacket encapsulates the upper teeth only.

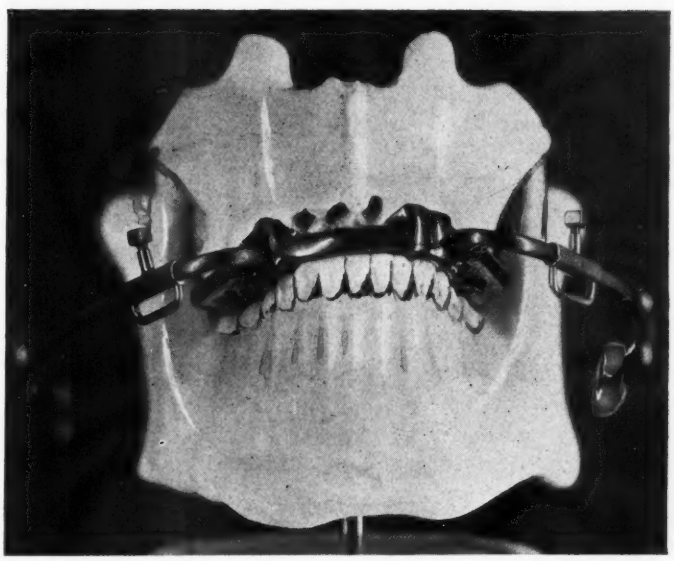

Fig. 27.—Splint for Class II (complete) fracture of the maxilla, with extraoral arms for cranial anchorage.

(a) Hemorrhage caused by reduction or excessive flow of saliva preventing dehydration of both fragments at the same time.

(b) Force required to retain the fragments in position being greater than fresh cement will withstand.

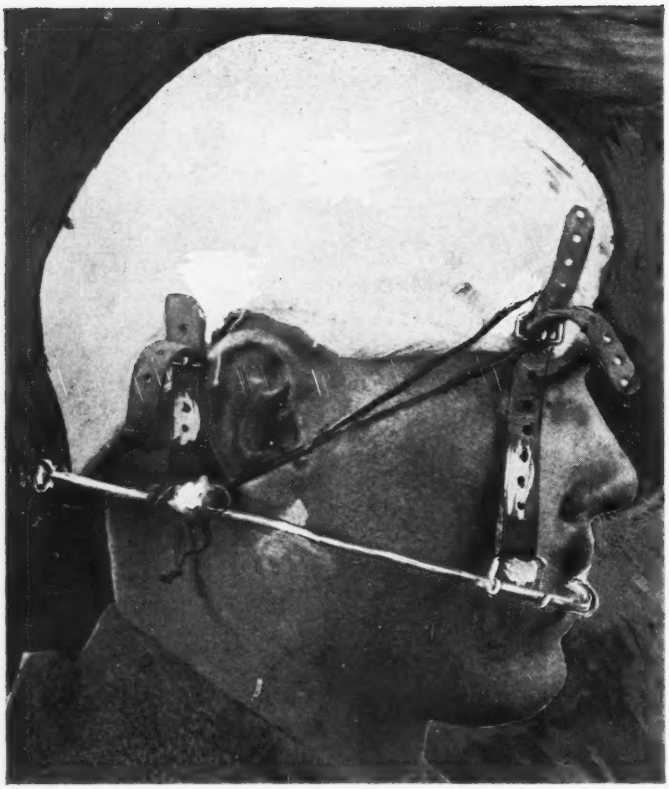

Fig. 28.—Orthopedic headcap providing anchorage for the splint in Class II or III fractures of the maxilla. (Bodine: Military Dent. Jour., Dec., 1921.)

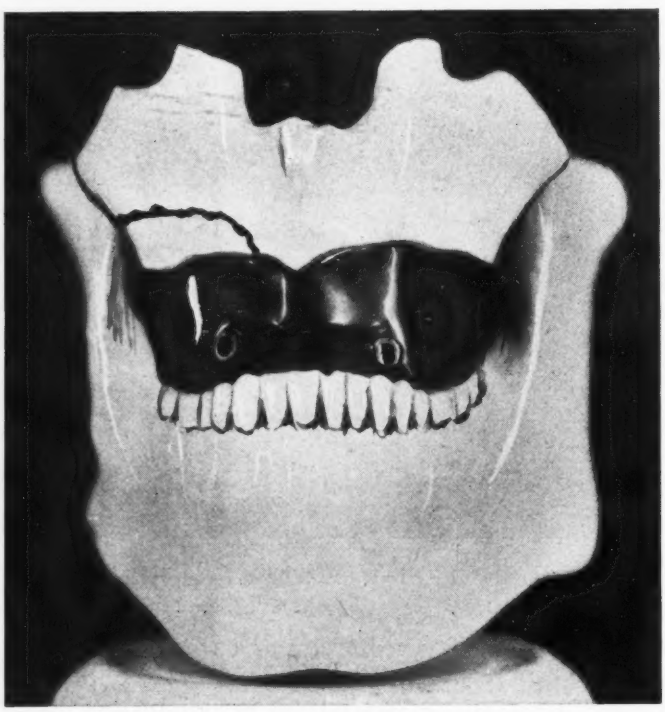

Fig. 29.—Vulcanite splint for Class III (edentulous) fractures of the maxilla, having tubes for the reception of extraoral arms for cranial anchorage.

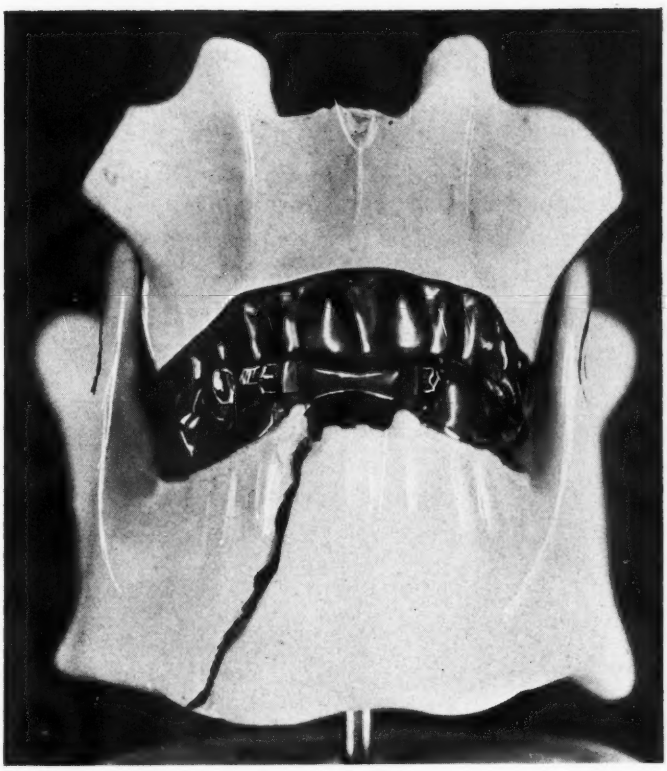

Fig. 30.—Sectional splint to allow reduction of the fracture after cementation. The bolt passing through the alignment tubes locks the sections together when reduction has been accomplished.

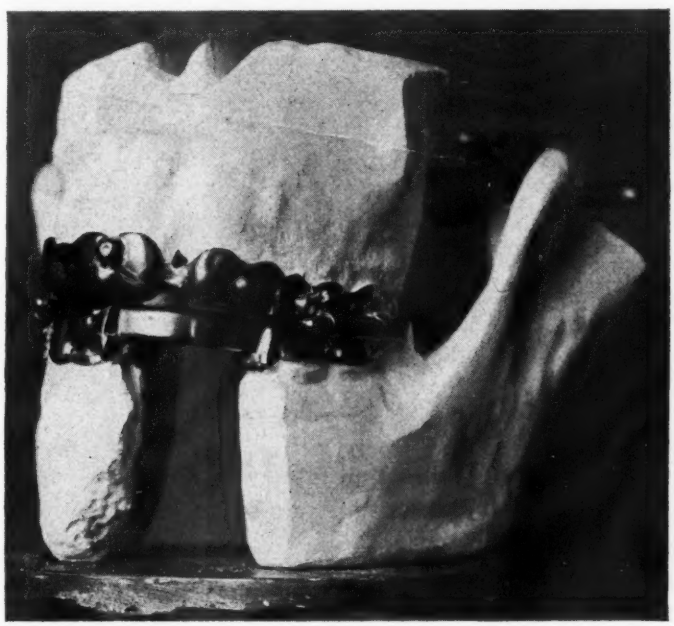

Fig. 31.—Sectional splint. Dove-tailed ends of the cast bar fit into corresponding sockets on the sections, locking them together after reduction.

(c) Surgery being required to reduce the fracture in cases with adhesions or partial solidifications in malposition.

In these cases the splint should be constructed in sections, one section for each fragment, and some means provided for locking the sections together after reduction has been effected. This may be in the form of a bolt passing through alignment tubes on the sections (Fig. 30), a bar with dove-tailed ends fitting in correspondingly shaped sockets on the splint sections (Fig. 31), or by lock-pins and tubes attached to the opposing splint jacket.

While adding somewhat to the difficulty of construction of the splint, and to the time required therefor, the ease of reduction afforded more than repays the operator.

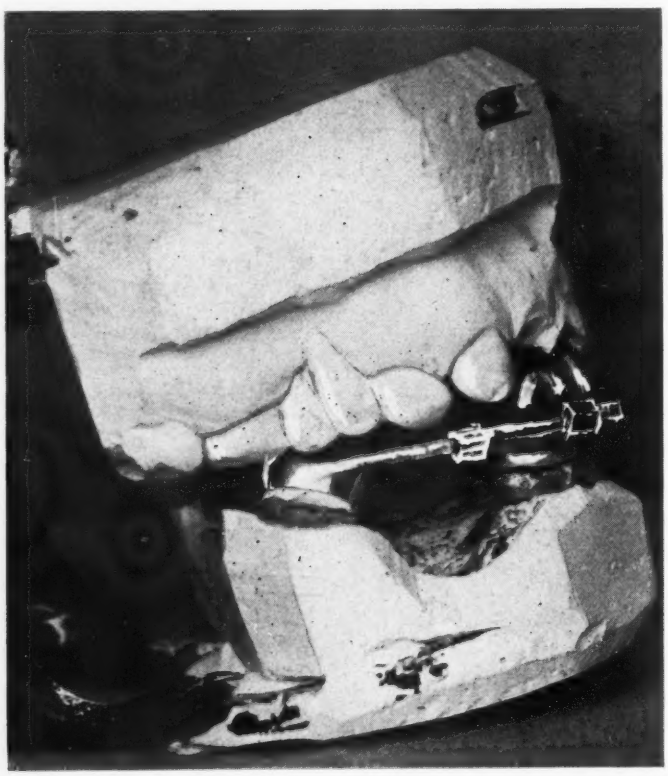

Fig. 32.—Gradual reduction splint for Class I fractures of the mandible. The bolt passes through a tube on the anterior section, and adjusting nuts provide for the desired movement.

SPLINTS FOR GRADUAL REDUCTION

Gradual reduction of fractures may be necessary or advisable because of fibrous union in malposition, impacted surfaces of fragments, excessive muscle pull or similar reasons which render manual reduction impossible. Crushing injuries, especially with resultant impacted fractures, make gradual mechanical replacements of the fragments advisable.

MANDIBLE

Class I.—These cases will most commonly be cared for by cast jackets on each fragment with a jackscrew or traction-screw interposed at the point

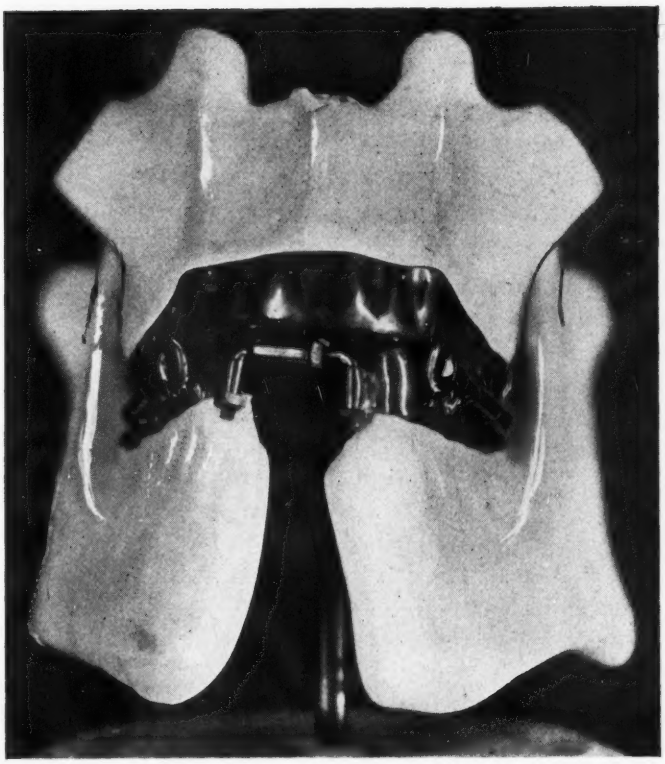

Fig. 33.—Gradual reduction splint, with swivel at each end of the jackscrew to compensate for the change in angle between sections during reduction.

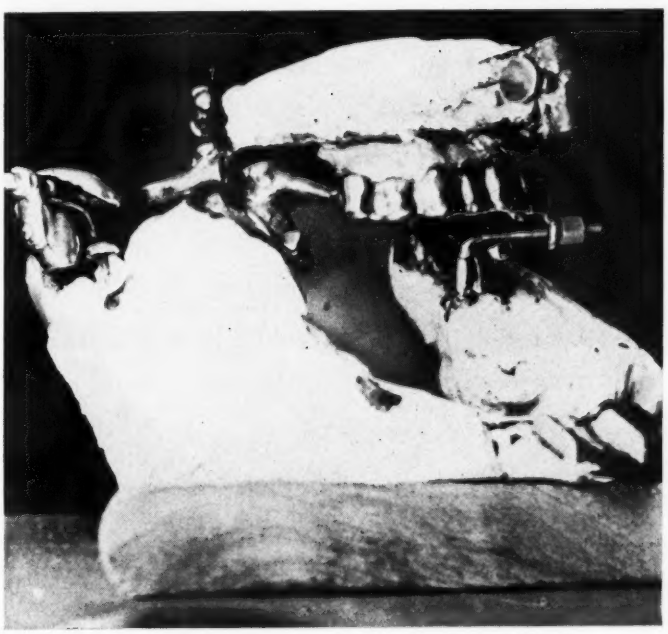

Fig. 34.—Gradual reduction splint for mandibular fractures having a long span between sections. The traction screw passes through a ring on the maxillary jacket, and is connected to the mandibular jacket with a swivel-joint.

of greatest leverage. The simple jackscrew in line with the desired movement is more efficient than a complicated mechanism (Fig. 32). If there is sufficiently extensive movement to change the angle of the two jackets appreciably, a swiveling arrangement on the jackscrew should be provided (Fig. 33). In cases with loss of substance or other condition resulting in an unusually long span between the two fragments, the jackscrew may be attached to the maxillary splint (Fig. 34). Lock-pins should be placed to anchor the fragments to a maxillary jacket when correct alignment has been attained. If the reduction is to require a considerable period of time to complete, a vertical flange may be attached to the buccal portion of the mandibular splint

Fig. 35.—Gilmer flange to prevent lateral collapse during gradual reduction.

in such a position that it will engage the buccal surfaces of the upper teeth and prevent deflection of the mandible toward the fractured side during the opening movement (Fig. 35). This will allow the mandible freedom of motion during this period.

Extraoral force may be used by attaching arms which emerge from the mouth, cross to the opposite side and terminate in hooks for the reception of rubber bands (Fig. 36). The constant force thus obtained has some advantages over the intermittent force which results from the use of a screw.

Class II.—An intraoral appliance consisting of an intermaxillary jacket splint with lock-pins immobilizing the anterior fragment, with a vulcanite sad-

dle for the posterior fragment provided with a jackscrew attached in line with the movement desired, will take care of this class of cases, provided there is not too much muscle-pull to combat and that the appliance will not have to

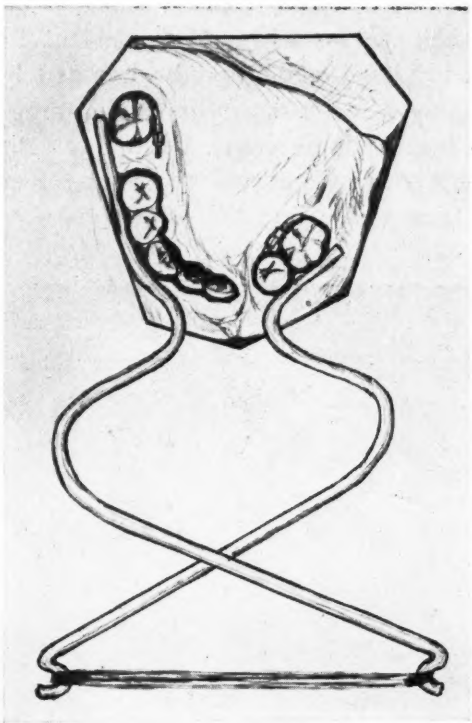

Fig. 36.—Appliance for gradual reduction of mandibular fractures. Rubber bands attached to extraoral arms provide constant pressure, instead of the intermittent force exerted by a jackscrew. (Bruhn.)

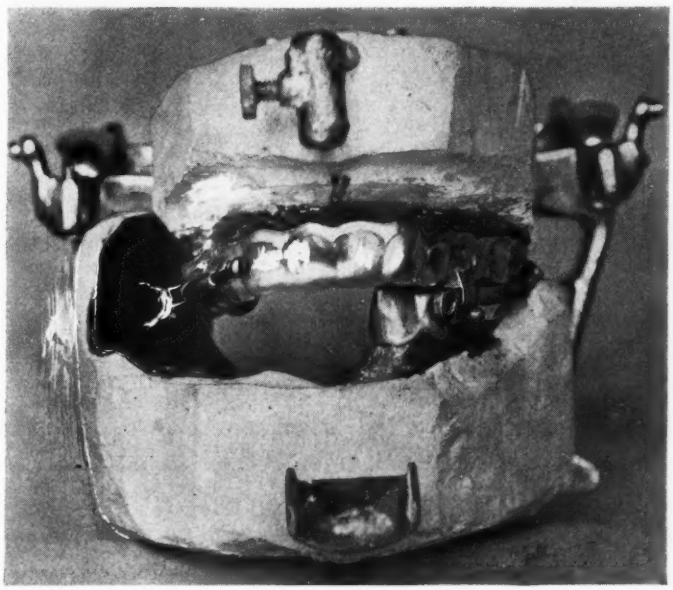

Fig. 37.—Gradual reduction splint for Class II fractures of the mandible. The jackscrew attached to the maxillary jacket is directed against the vulcanite saddle on the edentulous fragment. This splint is of value only when large saddles can be used. (Bodine: Military Dent. Jour., Dec., 1921.)

be under tension for many days (Fig. 37). In most cases, the author's extraoral appliance described previously for Class II fractures will be more satisfactory, as any desired movement of the fragments may be obtained by its use, and the position retained for any length of time.

Class III.—Edentulous cases will seldom present for gradual reduction. It is believed that such a case could best be handled by a double extraoral device, as described above, with micro-tongs grasping each fragment and connected by a rigid bar. Simple cases, without much displacement, could, of course, be handled by means of vulcanite saddles for each fragment, extending well down lingually and well into the retromolar space, and connected by

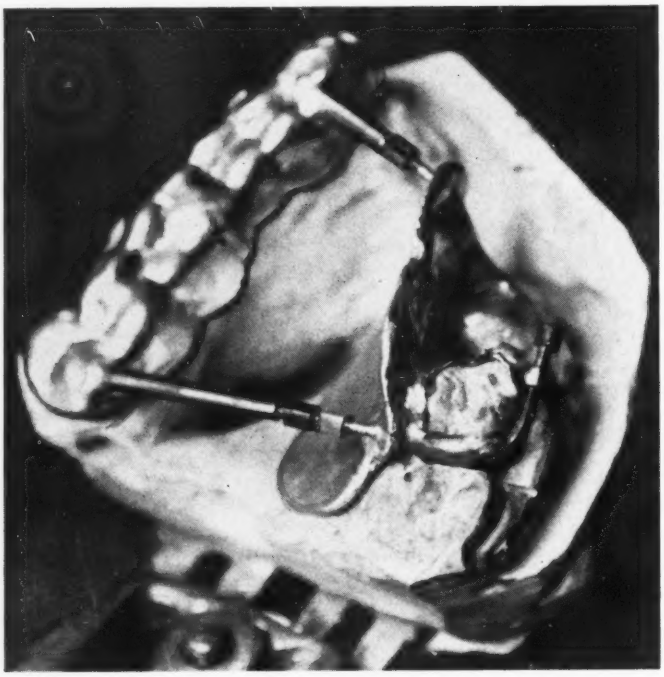

Fig. 38.—Gradual reduction splint for Class I fractures of the maxilla.

a jackscrew. Head and chincaps would be necessary to confine the fragments within the saddles. If much pressure is placed on an appliance of this kind, severe edema of the mucosa along the margins of the saddles is inevitable.

MAXILLA

Class I.—Partial fractures may be gradually reduced by means of cast jackets on each fragment, provided with jackscrews or traction-screws so placed as to produce the desired movement (Figs. 38 and 39). Slight vertical movement can be effected by means of elastic head-chin bandages, such as rubber dam, using the pressure of the lower teeth to force the upper fragment to position. Likewise, downward movement can be obtained by means of intermaxillary ligatures or rubber bands extending from the splint to bands on the lower teeth. By adjusting the angle of these ligatures, forward or backward movement will be obtained.

Class II.—The appliance previously described for Class II fractures of the maxilla will provide for the vertical reduction of the fracture. If there is a multiple fracture of the maxilla, jackets should be cast for each fragment and jackscrews or traction-screws placed between them to effect the desired movement. The Kingsley extraoral arms and headcap would provide for the retention of the entire maxilla. Anterior or posterior displacement can be corrected by elastic ligatures passing either from the anterior buckle on the headcap to the posterior loop on the arm, or from the posterior buckle to the anterior loop. (See Fig. 28.) Additional movement can be obtained by means of intermaxillary elastics from the splint to bands on the lower teeth. The headcap is sufficiently stable to allow the application of force to any one of the four straps independently without causing shifting of the headcap with consequent neutralization of the force. This is one of the great advan-

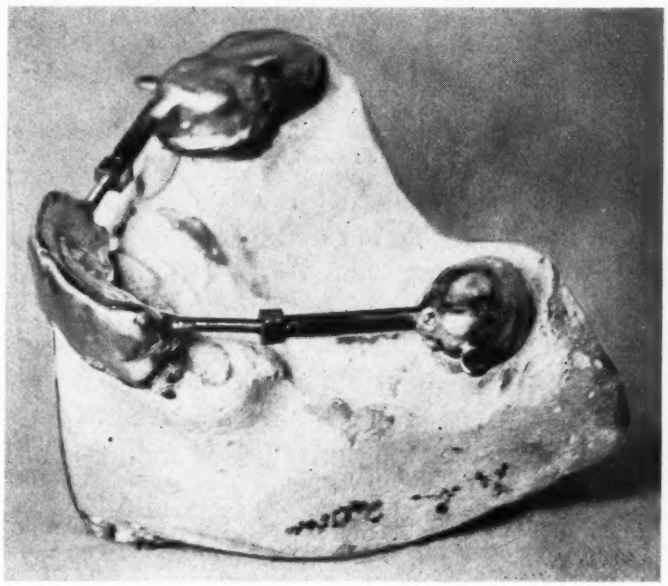

Fig. 39.—Gradual reduction splint for Class I fractures of the maxilla.

tages of the orthopedic plaster headcap over those made of other materials, or over appliances depending upon the forehead for their foundation.

Class III.—A combination of the splint previously described for Class III maxillary fractures with the elastic ligatures described above would take care of all probable displacements of an edentulous maxilla.

RECONSTRUCTION SPLINTS

Reconstruction splints are used to correct deformities which remain after the original wound has healed, frequently because of the lack of definitive treatment or splinting at the time of injury. The general principles of design and construction are the same as for fixation splints, and depend chiefly upon the surgical procedures anticipated. Reconstruction splints will frequently be provided with pads for cheiloplasty, scaffolds for rhinoplasty, or with

retainers for epithelial inlay stents, and may provide for two or more contemplated methods of treatment. For example, gradual reduction of an ancient fibrous union may be attempted, but with provision in the splint for immediate fixation if surgical reduction becomes necessary.

The designs given under the classification for fixation splints will provide for most cases.

(To be continued.)

NOTE.—This is the second of a series of articles by Captain Bodine. The next will appear in an early issue.

A PRACTICAL CONSIDERATION OF CYANOSIS IN ANESTHESIA

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THERE are many factors which affect a smooth, safe anesthetic induction. Some are physiologic, some psychic. The operator who would become an anesthetist must study his patient as an individual, special case, for there is no definite universal technic unvarying in successive administrations. This thought is not new. It is, withal, in urgent need of reiteration and re-emphasis at a time when there is apparent a growing interest on the part of the general practitioner in anesthesia by inhalation for exodontia and minor office practices such as pulpotomy and tooth-cavity surgery. The operator should of course thoroughly acquaint himself with the theoretic aspects of general anesthesia in so far as they affect the underlying principles of induction and maintenance. But it is only from repeated experiences in hundreds of cases that he will begin to achieve a degree of skill sufficient to make him feel at home with general anesthesia. He will find as time goes on that patients are peculiarly affected by certain gas mixtures as they are by climates and foods. No preanesthetic examinations of a subjective or objective nature can prescribe for his patient the *exact* dosage of anesthetic. The latter becomes in his hands an instrument like the scalpel. The surgeon incises, exposes tissues, and proceeds with his dissection according to the indications of pathosis. The anesthetist guides his patient from the conscious to the subconscious and from the subconscious to the unconscious carefully and watchfully, heedless of the prescribed anesthetic formula, mindful only of the patient's heart action and respiration. The skilled surgeon does not know in advance of his operation just exactly what he is to encounter. The skilled anesthetist knows no more. Both are prepared for every emergency. It is the departure from the normal which the operator is ever on the lookout for. Success comes to him who has encountered and solved these problems.

Confining ourselves for the moment to inhalation anesthesia, let us ask ourselves: "What are we to be on the watch for?" Is it not cyanosis? Assuredly, that is the pivotal key to successful inhalation anesthetic technic. What

is it, and how can the operator carry his patient safely into a period of lapse of consciousness free from cyanosis? When the patient becomes cyanotic, what restores him to oxygen stability? When cyanosis deepens to stertor what must be done to restore safe anesthetic balance? When stertor deepens to paralysis of the respiratory muscles, what measures of prompt relief must be initiated? These are fundamental questions which interest us all, the experienced no less than the novice. Just as it has been said that the only thing *constant* in life is *change,* so it may with equal propriety be declared that the only constant feature in anesthetic technic is change. Once the operator has mastered this idea, he is safely embarked on an anesthetic sea of safe sailing. In these days of standardized apparatus for delivering and maintaining gases, I want to sound a word of caution lest we become discouraged with general anesthesia shortcomings, and fail to develop a wonderful aid to dental practice.

It is my purpose in this treatise to discuss cyanosis in anesthesia with especial reference to nitrous oxide and oxygen. My reasons for doing this are, first, because I believe it is par excellence, the office anesthetic for the dental operator, and second, because I have employed it exclusively in my practice for twenty years.

The element of cyanosis may enter to mar our anesthesia in two ways: First, from a disproportionate mixture of the gases, to the exclusion of a safe necessary quota of oxygen in the tidal inhalation, and second, from a mechanical interference of the inhaler or the "throat pack" with the free passage of the gases from the delivery apparatus to the lungs. I shall discuss the latter factor first as it requires less deliberation for the moment.

It is the custom of good operators to employ the nasal inhaler rather than the face inhaler to deliver the anesthetic mixture to the patient. This is to be encouraged and by all means to be cultivated by the operator who is taking up this work and wishes to perfect his technic. Nasal delivery means a smooth anesthesia because it enables the operator to perform his tasks without fear of a too early recovery overtaking before completing an operation prolonged unexpectedly. Nasal inhaling devices must necessarily be small. The smallest is in the way, very, very often. We must get along the best we can however, until some ingenious technician devises a set of flexible tubes that will enter the nares, form a leak-proof association, and stay put without interference with operative procedures in the mouth, and the maxillary regions in particular. Until that happy day, I can recommend the Heidbrink and the McKesson Nasal inhalers as being the best so far devised for nasal gas delivery. But these inhalers may induce failures in anesthesia through faulty seating at the initial application or unseating during the operation. Cyanosis ensues because there is a mechanical interference with nasal inhalation resulting in an anesthetic disbalance. In adjusting the inhaler, the anesthetist must see that the rim of the appliance does not compress the nares laterally, nor occlude them from below. Both of these things occur during the excitement of anesthesia and surgery when the operation itself seems to engage all absorbing interest. In operations upon the maxilla, when the lip must be raised, there is always the danger that either the operator or the nurse will force the base of the rubber up in such

a manner as to occlude the nares and interfere seriously with the already smooth anesthesia. My suggestion to eliminate this danger is to see that the base of the inhaler is always midway between the nares and the lip mucosa. The assistant should hold the apex of the inhaler against the bridge of the nose and guide it so that it does not shift laterally. In this connection it is timely to indicate that no inhaler is self-retaining in every sense of the term. The assistant is the only sure retainer. Shifting is unavoidable otherwise, resultant from the patient's movements no less than from the operator's manipulation.

Throat protection during the operation, is, of course, a necessity. But in my practice I find that it is sufficient to place a gauze sponge of suitable size just posterior to the area to be operated upon. It is quite unnecessary to force the sponge down at the base of the tongue. Again, I find that the position of the patient in the chair has much to do with achieving a safe, smooth anesthesia. I do not see any need for having the patient prone on his back, or the chair tilted back to any extent. At no time is the patient who is sitting up, with the head raised to give clear passage to the gases, in any danger of aspirating blood and mucus or having the tongue drop back into the throat. The blood should drain out over the chin if the upright position is maintained.

Dr. James Tayloe Gwathmey, a world renowned authority on anesthesia has declared to me that for comparatively brief anesthesias, as the great majority of our dental operations require, my upright position is to be favored. He has also declared that this upright position of the patient minimizes the increase in blood pressure caused by nitrous oxide and oxygen.

We have now discussed the influence of the improper application of the inhaler and the "throat pack" as factors inducing cyanosis. Let us see how cyanosis results from a disproportionate mixture of gases.

Administered without oxygen, nitrous oxide rapidly brings on asphyxia through its paralyzing influence upon the centre of respiration which has been deprived of the vital oxygen. In a respiratory volume of 100 per cent, oxygen inhaled during conscious respiration forms 20 per cent of the air mixture.

Loss of consciousness results from a substitution of nitrous oxide for oxygen in the blood, with the hemoglobin of which, the nitrous oxide forms a loose chemical compound. It is the aim of anesthetic induction with nitrous oxide and oxygen to suspend consciousness by introducing a mixture of the gases (the nitrous oxide and the oxygen) of such relative respiratory volume as to be safe and sufficient to induce anesthesia and sustain life. Theoretically, a mixture of seven to ten per cent of oxygen and ninety-three to ninety per cent of nitrous oxide is sufficient to induce anesthesia free from the dangers of cyanosis. Apparatus are designed to deliver these gases to the patient in these proportions, set with proper dials, disks and arrows. The patient is expected to go to sleep. But frequently he does not go to sleep at all. He is just stupefied. Sometimes he goes to sleep only too quickly and gives the anesthetist grave alarm. The trouble comes from endeavoring to standardize gas mixtures. It cannot be done. Percentage of successes does not count here. Each patient is 100 per cent. To him, a failure is 100 per cent. It avails him naught if he is only one in a hundred thousand who succumbed. The careful anesthetist endeavors

to find for his patient the mixture of nitrous oxide and oxygen which will induce a slow, nonirritating anesthesia. Dials are only the starting points and should not be depended upon implicitly. Dials frequently go wrong. Any autoist can attest to the frequency with which speed indicators get them into conflict with highway police. The comparison is not far-fetched. The careful anesthetist should gauge his gas flow just as carefully as the autoist his speed, regardless of speedometers or diaphragm gasometers.

Cotton and Boothby of Boston have enunciated two cardinal principles in inhalation anesthesia, which to me are really the essential guide to successful nitrous oxide and oxygen anesthesia. First, there must be an absolutely regular flow of each gas at any rate desired, without the necessity of frequent valve manipulation. Second, the flow of the gases must be rendered visible, so that their proportion can be approximately estimated at a glance.

I have followed these precautions for twenty years and find myself increasingly pleased with my results. Signs of threatening cyanosis are quickly and *obviously* corrected. The gases bubbling in a mixing chamber filled with water can be *actually* determined, and no dependence placed upon numerical radiations on a meter or pressure gauge.

For the correction of cyanosis due to a disbalance of nitrous oxide and oxygen, the flow of nitrous oxide should be reduced and that of the oxygen increased. Simple enough. Where then does the danger lie? The answer is simpler than the remedy. The danger of deep cyanosis lies in the rapid onset of asphyxiating symptoms which may or may not quickly respond to remedial measures. Oxygen is the key which turns the balance between safe anesthesia and dangerous cyanosis. It is but necessary to increase the flow of oxygen. So far so good. But sometimes this fails. And why? Because we must remember that if the respiratory muscles are threatened with paralysis, or if they are already paralyzed, how can oxygen alone stimulate muscular activity? It is necessary to apply intermittent pressure against the diaphragm, giving stimulation to the musculature of the thorax, in the meantime keeping the air passage open by placing the index finger in the mouth at the base of the tongue and lifting the tongue upward and forward. Oxygen is being forced into the lungs in the meantime. This is really a technic which will bring added safety to the administration of nitrous oxide and oxygen. It will quickly restore a patient to the safe anesthetic stage and make cyanosis, with respiratory paralysis in the offing, something less to be feared by the operator. A direct flow of oxygen, with the nitrous oxide supply discontinued, will bring about this result. Percentages are not figured here. The valve is opened wide and the patient's lungs well ventilated with oxygen. As soon as the skin shows signs of returning color and the purplish hue of cyanosis has disappeared, the relative flow of the nitrous oxide and oxygen gases are again permitted passage, if the anesthesia is to be continued.

Sometimes a patient will evidence signs of extreme rigidity and cyanosis and "doubles up," turning the body into a position which makes continuance of the operation unsatisfactory. I favor abandonment of the anesthesia in these cases. Forcing an anesthetic leads to danger zones. There is a limit to what I

consider legitimate "forcing" of the anesthetic. When we are trying to pass our patient quickly from a stage of undue excitement into anesthesia, it is permissible to "force" the gases. But a return to normal flow of relative proportions should be speedily effected or the patient will soon show signs of cyanosis.

The stimulated type of patient, who is so difficult to anesthetize with nitrous oxide and oxygen is more often the type who is the victim of cyanosis. Being difficult to put under, he is given added pressure of the gases. Therein lies the danger. Forcing of gases should be very carefully resorted to, if at all, if we are to minimize the dangers of cyanosis. These patients need premedication preparatory to the nitrous oxide and oxygen, or ether substituted for the nitrous oxide.

When the unexpected happens, it is well to be prepared to resort to the emergency measures which may restore the pulse and stimulate respiration. Vigorous slapping on the chest is recommended in addition to those already suggested in this treatise, and lowering of the head. Dilatation of the Sphincter Ani sometimes has brought the patient to and should be borne in mind as an emergency procedure. The author has witnessed one case at the hospital where rectal dilatation added to compression force against the side of the chest brought respiration back to a patient whose pulse had disappeared during the ether narcosis.

If, as has been so aptly stated by Gwathmey, "shock is an overstimulation of the whole motor mechanism," then my final word of caution at this time is to say—do not force gases into the patient under excessive pressure, because by this means we speedily and surely induce an overstimulation which brings on cyanosis. Gases inhaled at low pressure, fifteen to twenty pounds per square inch—atmospheric pressure—administered evenly, will, in the great majority of cases produce a safe, even anesthetic state, relatively free from the paralyzing effects of cyanosis.

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DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

Edited By
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A DISCUSSION OF THE PRINCIPLES INVOLVED IN THE RADIOGRAPHIC STUDY OF FACIAL DEFORMITY

DR. CLARENCE O. SIMPSON, ST. LOUIS

THE article entitled *A Radiographic Study of Facial Deformity* by Dr. Martin Dewey and Dr. Sidney E. Riesner in the March, 1928, issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY demands some constructive criticism. Knowing Dr. Riesner's earnest attitude toward professional problems, there is no intent to ridicule his contribution, or discourage his investigations. Knowing Dr. Dewey's hypercritical proclivities, it is surprising that he collaborated in the presentation of a defective technic. However, since orthodontists are extending their diagnostic vision beyond the first molars, and giving more attention to facial measurements than formerly, a paper describing an inaccurate method for the study of facial deformity might be accepted as authoritative and lead to the general adoption of an erroneous procedure. Furthermore, the paper in referring to the technic recommended by me to the American Society of Orthodontists in 1923, and implying that an improvement had been effected, calls for a discussion of the principles involved so the comparative value of the features in disagreement may be judged.

Dr. Riesner in suggesting the apparatus for the purpose, stated that the x-ray machine of preference is one that may be controlled to, or has a maximum capacity of a three inch spark gap with ten milliamperes of current. In contradiction of this statement, a four or five inch spark gap will produce a similar radiographic result as that of a three inch gap, and greatly improve the perspective if a longer target-film distance is used. With the exposure time at inverse ratio, the milliamperage employed has no direct effect on the radiographic result. Why should an operator with a thirty milliampere tube use only ten milliamperes? By employing thirty milliamperes, the exposure time would be reduced to one-third, with a corresponding one-third risk of movement during the exposure which is an important factor in all radio-

graphic examinations of young patients. The operator with apparatus limited to ten milliamperes and 45 kilovolts must modify all radiographic technic to his restrictions, but to specify these factors as the maximum requirement, or claim that they are advantageous is incorrect.

Dr. Riesner suggests the use of cardboard exposure holders instead of cassettes with intensifying screens, giving as a reason that intensifying screens tend to destroy the fine detail of the facial contour desired. The improvement of modern intensifying screens has almost eliminated the perceptible grain in negatives, and do not impair the definition in radiatized films. The reduction of the exposure time to approximately one-fourth by the use of intensifying screens,

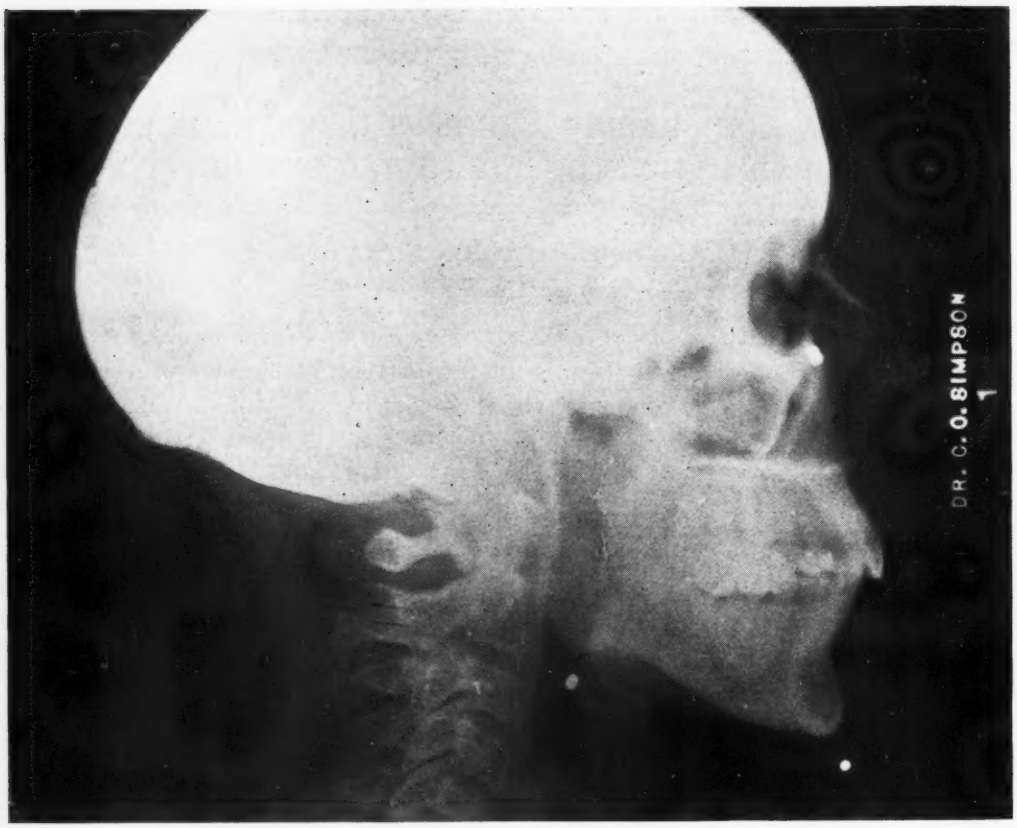

Fig. 1.—An illustration of the perspective in a radiographic image at a target-film distance of fifteen feet, the film parallel with the sagittal plane, and markers attached in the region of the gnathion, and the orbitale, gonion, and tragion on the left and right sides. Excepting the parietal region, the head and face are registered considerably within the extent of an 8 x 10 film, and the markers on the right and left sides are almost superimposed. (The illustrations in this article are not intended to show the soft tissues, but the relation of the markers and the linear perspective.)

quadruples the probability of sharp detail not being impaired by movement. Intensifying screens increase the contrast in the radiographic image, but the decrease in exposure time more than compensates for this, and chemical reduction is indicated for the denser areas of radiographic films of excessive local contrast.

Dr. Riesner recommends a thirty-six inch target-skin distance so the entire film will be included in the exposure. This distance is ample to include the film, but it is decidedly not sufficient for acceptable linear perspective. Pre-

sumably in the study of facial deformity, orthodontists consider the relationship of the orbitale, gnathion, tragion, and gonion. In a radiographic profile the tragion is difficult to register, but there is the advantage of visualizing in the saggital plane the relation of the facial contour to the bones and central incisors. If this study is to be of scientific value, distortion must be minimized to the practicable limit. Radiographic profiles made at a thirty-six inch target-skin distance show an obvious distortion, and this distance is not the practicable limit even with a three inch spark gap. Orthodontists appreciate the necessity for a relatively long focus lens in their clinical

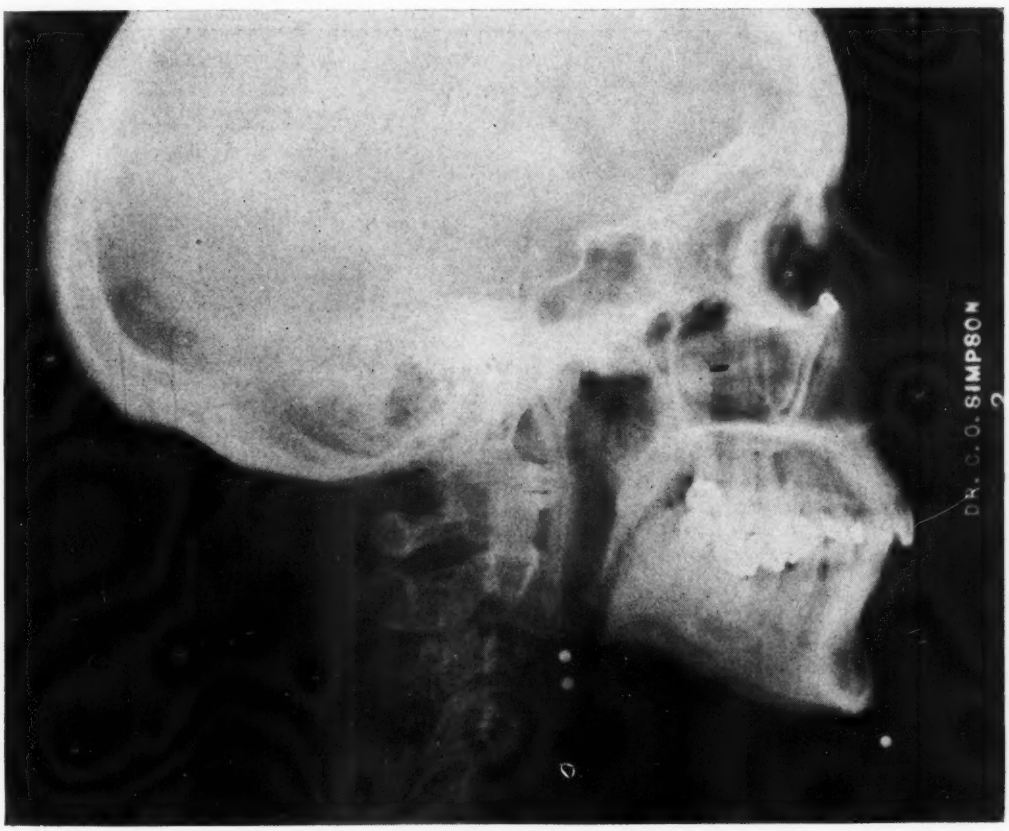

Fig. 2.—An illustration of the perspective in a radiographic image of the same subject as in Fig. 1, at a target-skin distance of three feet, and the film parallel with the sagittal plane. An 8 x 10 film barely accommodates the image of the head and face, there is an obvious difference in the perspective, and the markers in tragion and gonion regions are widely separated.

photography, and it would be inconsistent to adopt a radiographic technic which is remediably defective in the essential perspective.

To demonstrate the effect of distance upon perspective, Fig. 1 is an illustration made at a distance of fifteen feet which is entirely feasible with a five inch back up, the markers placed in the region of the orbitale and gnathion are registered at 91 millimeters apart, and the markers in the region of the gnathion and gonion are 70 millimeters apart. In Fig. 2 an illustration of the same subject made at a thirty-six inch target-skin distance, the orbitale-gnathion distance is increased to 108.5 millimeters, and gnathion-gonion distance to 81.4 millimeters. Also, in Fig. 2 the right and

left gonion markers are separated 6.5 millimeters, while in Fig. 1 they are almost superimposed. This test records a distortion amounting to 17.5 millimeters in the orbitale-gnathion distance, and 11.4 millimeters in the gnathion-gonion distance by reducing the exposure distance from fifteen feet to three feet.

Dr. Riesner states that the x-ray tube is focused at right angles to a plane that bisects the head of the median line. Discounting the ambiguity, this is probably intended to describe that the central rays are directed perpendicular to the sagittal plane, but does not specify where the rays are

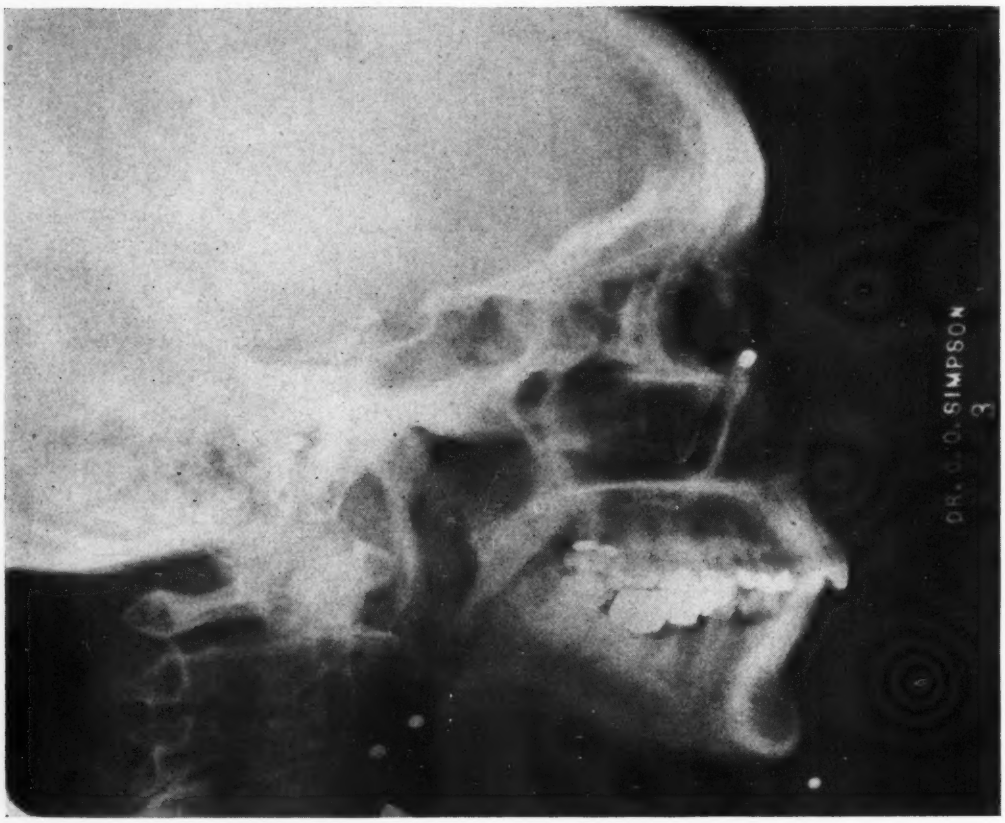

Fig. 3.—An illustration of the perspective in a radiographic image of the same subject as in Fig. 1 at a target-skin distance of three feet, with the film inclined thirty-five degrees toward the face instead of parallel with the sagittal plane. The occipital portion of the head is projected off the film, the perspective bears little resemblance to that of Fig. 1 or Fig. 2, and the markers in the gonion region are more widely separated and registered as elliptic instead of spheric.

centered. At a target-skin distance of thirty-six inches, there is a marked difference in the images when the rays are centered at the pronasion, gnathion, or tragion. At this distance with the film parallel with the sagittal plane, the distortion would be more evenly distributed by centering at a location equidistant from the significant landmarks approximately corresponding to the crown of the maxillary first molar. This was the location at which the rays were centered in Fig. 2, and Fig. 3, and since accuracy is essential in this factor at a short exposure distance, a centering attachment for the cone was used.

The most important contention is regarding Dr. Riesner's description that the film held against the face assumes the angle of the face as it slopes from the temporal region to the nose, a difference of about thirty-five degrees from a right angle. Presumably this is done to improve the detail by shortening the distance between the film and profile, but any advantage is far counterbalanced by increasing the distortion of the image. With the film in this position, if the central rays are directed at the subnasion, the distortion in the region of the gonion is excessive. If directed at the maxillary first molar crown, the distortion noticeably affects the image both in the profile and gonion regions. Only by directing the central rays about the mastoid region can a marked distortion of the face be prevented, and this would not be a median profile view since the diverging rays would project more of the lateral incisors nearer the tube than the central incisors. The probability of this technic having been used by Dr. Riesner is indicated by his illustrations which do not appear as median profile views. Also his illustrations were not made with the teeth in centric occlusion, and the lips in contact, which distinctly impairs the value of the views for study of facial deformity.

Fig. 3 illustrates the distortion produced in the gnathion-gonion dimension by following the technic described by Dr. Riesner, and directing the central rays at the crown of the maxillary first molar. The orbitale and gnathion markers are registered 105 millimeters apart which is 3.5 millimeters less than when the film is placed parallel with the sagittal plane at a target-skin distance of thirty-six inches because the nearer relation of the film has partially compensated for the objectionable divergence of the rays. However, the distance between the orbitale and gnathion markers is still 14 millimeters greater than in the view exposed at fifteen feet. The distance between the gnathion and farther gonion markers in Fig. 3 made by Dr. Riesner's technic is 108.5 millimeters, which is 27.1 millimeters greater than when the film is placed parallel with the sagittal plane at a thirty-six inch target-skin distance, and 38.5 millimeters farther than in the view exposed at fifteen feet. Moreover, there is a separation of 12 millimeters between the left and right gonion markers. A method of examination with such a factor of error is not a reliable basis for serious study.

Dr. Riesner's suggestion that two films be placed in the cardboard holder to be exposed at the same time, and one of them half-developed to show the soft tissues, and the other fully developed to get better bone detail is a substitute method of doing each. Better results would be obtained by exposing for the soft tissues, and making another exposure which would not be a compromise, in revealing the bones. If for any reason negatives of different density were desired in one exposure, they could be best obtained by using a cassette with the front intensifying screen detached, placing one film between the screens. and the other in front of the screens.

Dr. Riesner recommends tank development as preferable because of convenience, economy, and quality secured in the negatives. Tank development offers these advantages only for a large volume of work. Since ortho-

dontists probably do not develop a large number of radiographic or photographic films every day, tray rather than tank development offers the advantages specified. A three compartment tank accommodating 8 x 10 films occupies considerable space in a dark room, and if the temperature is to be maintained properly, it must be accessible to running water and drainage, which is unlikely to be convenient. When a gallon of developer is put into service, it progressively deteriorates from use and oxidation after the first day, and for a small amount of developing is not economic if the solution is kept normally active. If the developer is allowed to deteriorate, the quality of the negatives is impaired, and after even moderate use is slower in action. In using trays eight ounces of fresh developer may be quickly brought to the proper temperature and used for two or three 8 x 10 films, and discarded. The only precaution about developing duplitized films in a tray is to apply the developer evenly, and turn the films about every thirty seconds. Several films can be developed simultaneously in a tray by orderly rotating their location from bottom to top. For dental films a small bowl or tank with a capacity of twelve ounces may be used to advantage. By mixing a gallon of developer, and keeping it in quart, or half-gallon stoppered bottles so the solution in each bottle is preserved from oxidation until needed, a fresh supply is available for convenient use.

Appreciating that a critical discussion of the methods recommended by Dr. Riesner, may not leave the reader with a clear conception of a practical system for radiographic profile study, it is essential to direct attention to the errors and present the advantages of other methods before describing an acceptable procedure. In a subsequent article concise directions will be stated for obtaining radiographic profile views with three inch or 45 kilovolt machines. and also with apparatus of greater capacity.

ABSTRACT OF
CURRENT LITERATURE

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA
DENTAL RADIOGRAPHY
By Dr. Edward Preble, New York City

NUTRITION AND PEDIATRICS
By Dr. Samuel Adams Cohen, New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Orthodontia, Oral Surgery and Radiography

Does the Toothbrush Prevent Caries? Editorial in Dental Items of Interest, October, 1928.

Aside from the cosmetic use of the brush its chief value should be in the conservation of the teeth. Since caries is so eminently a disease of childhood when dental hygiene must be enforced from without we must regard the brush as used by older subjects as chiefly intended to keep caries from progressing. The editor takes up the subject editorially by reason of a recent article in which while the brush was praised gum massage was held to possess the greater value. The quoted author, Dr. Buckley, in this connection cites another writer, Thorpe, who is frankly opposed to the brush, but chiefly because it is not sanitary and can injure the soft tissues. The editor himself cites Talbot's paper (1917) in which he accused the toothbrush of not having made good and largely because it can only hit on prominences and thus miss the crevices where lodges the food débris, etc. These are serious arguments yet the toothbrush is not ready to go and it may be that a few simple precautions may minimize its shortcomings. Thus it may be kept permanently when not in use in an antiseptic solution but as this course would doubtless injure the bristles it could be placed in the bath only a short time before intended use. So much for the toothbrush as unsanitary. In regard to its value as a preventive of decay the evidence is weak. As stated the brush does not clean out the interstices and moreover the regions where caries begins are naturally clean and do not require brushing while the regions which the brush does clean are not predisposed to caries. If as Hyatt teaches caries begins in occlusal fissures the brush can have no value. There is one region however—the cervical—which the brush can keep clean and thus possibly a certain amount of decay can be forestalled or minimized.

Dental Infections and Heart Disorders. S. Calvin Smith (Philadelphia). The Dental Cosmos, October, 1928, lxx, 10.

The author is a physician well known for his studies on the heart. He has conferred on the subject of this paper with dentists and cardiologists.

The internist in medical practice must constantly call upon some expert in another line in arriving at his diagnosis and one of these is the dentist. Heart disease is seldom primary and this fact makes it necessary to call on the knowledge and skill of other specialists. For some reason the internist is apt to undervalue the opinion of the dentist as a consultant. The incentive to extract all of the teeth does not come from the latter for the internist is depending on the roentgenologic diagnosis which often is unfavorably colored by wrong interpretation. At the same time the patient is told that his teeth must come out, some conservative dentist may be doing his best to save the doomed teeth. On the other hand the dentist may be at fault and may give the patient advice, from quite different motives, not to have his teeth pulled, not to have infected bridge abutments extracted and so on. It is to be hoped that these extremists will grow fewer in numbers and that consultations between internists and dentists will not be one-sided affairs. Among the author's conclusions we find that heart irregularities sometimes subside after the surgical removal of peridental infection. Peridental abscess is one condition which may call for extraction in an unequivocal manner. Absence of rarefaction may not mean that the teeth are innocent but positive roentgen finds should be checked up with clinical tests, notably those for vitality. In any obscure case of heart disease there should be roentgenologic and clinical tests of the teeth.

Nutrition and Pediatrics

The Distribution and Extension of Tuberculosis. Gerald B. Webb. Jour. Am. Med. Assn., September 15, 1928, xci, 11.

Infection by the human tubercle bacillus is usually by way of the air. Infection by the bovine bacillus is by ingestion and far larger number of bacilli are needed.

A tubercle bacillus, protected from busy digestion by its coat of wax, is engulfed by a phagocyte when it gains entrance to the body. The phagocyte carries the bacillus eventually to a lymph node, and it is here that the typical defense of the organism begins with tubercle formation, and it is in the lymph nodes that the first manifestations of tuberculosis are apt to be found.

The route by which different nodes become infected has been suggested by Krause. Bacilli reach the heart by means of the thoracic duct and are then passed into the lungs by the pulmonary arteries. Some bacilli become collected by the tracheobronchial nodes and bronchial lymph depots; others pass to the left heart and out into the general circulation, eventually draining into distant lymph nodes.

Webb states that it is known that infection has access to all organs and tissues by way of the blood stream. It has been conclusively proved that "bacillemia" without acute general miliary tuberculosis occurs in a considerable percentage of cases of pulmonary tuberculosis, and there is a strong presumption, from the presence of tubercles in liver and spleen, that it occurs at some time in all, or nearly all.

A Study of Active Tuberculosis in Children. A. Levinson. Arch. Pediat., July, 1928, xlv, 7.

Levinson reviews his study of 119 children under twelve years of age in the Pediatric Department of Cook County Hospital in Chicago, and only children having active tuberculosis are included in this series.

The relation of tuberculous cases to the total admission averaged about 7 per cent.

In studying the etiologic factors Levinson feels that contact from a tuberculous parent or relative is the greatest factor in the causation of tuberculosis in these children.

Measles was considered a predisposing cause in over half the cases. Although ninety-seven of these 119 cases of tuberculosis had some form of pulmonary involvement, the symptoms of acute pulmonary involvement were strikingly few. Practically all those cases had, however, a cough, and in most instances the cough was mild.

In discussing the diagnosis, the author found that the laboratory and more particularly the roentgenogram was of the greatest assistance.

During thirteen months' observation of the series of 119 cases, 92 died. Age played a rôle in the prognosis of this series, the younger the patient, the worse the prognosis.

Levinson emphasized a well-known fact in the treatment, namely, that prevention rather than treatment is the greatest weapon combating tuberculosis.

Factors in the Pathogenesis of Tuberculosis. Allen K. Krause. Am. Review of Tuberculosis, August, 1928, xviii, 2.

In a masterly presentation Krause defines some of his views of the factors in the pathogeneses of tuberculosis.

It is rather common, he states, for the anatomic effects of tubercle-bacilli to exist in the body quite unfelt and unknown to the individual. On the other hand, when tuberculosis infection is present, in the long run it is the effect upon the man rather than its effect upon the individual organ that counts. In other words, it is only as a person is disturbed by the tubercle that he has tuberculosis that is pathogenic, that is, originating illness.

Pathogenesis in the individual case has to do with the awakening of activity whether this is setting in for the first time or is being repeated. Any and every case of tuberculosis infection is active in which symptoms are occurring spontaneously or in which they can be elicited, and in which such symptoms result from the presence and activities of the tuberculosis processes.

According to this authority the most prominent symptoms may be fatigability or lack of endurances or abnormal tardiness in recovering from fatigue, abnormal height or depression or range of temperature, or cardiovascular or digestive irritability and instability, or the onset or the accession of cough or expectoration.

Local injury, with current disease, excessive bodily or organic stress are the most important factors which may bring on the symptoms of an individual harboring the tubercle. It is important to remember that foci of tubercle go through well recognized cycles of development and subsidence, and are quite likely never exactly the same at two different times. Therefore, in contributing to a breakdown from tuberculosis, it matters a great deal from the point of view of symptoms whether a child contracts measles or an athlete runs a hard race, or a woman becomes pregnant at a "good" time or a "bad" time, so far as the anatomic condition of concealed tubercle is concerned.

In explaining the alleged hypersusceptibility of primitive people to tuberculosis, it is Krause's opinion that history will not show a single example of a primitive people continuing along the line of improvement in physique and natural development after it has come under the influence of people of a higher civilization.

Tuberculosis is the price entailed by civilization in refining man, in taking him from more natural pursuits, and putting him under the more artificial complexities of modern existence.

In discussing the innate differences of constitution Krause states that human beings differ in their anatomic responses to tubercle bacilli which infect them.

Moreover, there are individuals who have certain diseases which react differently to the infection with tuberculosis. For example, people having gout either do not fall ill with tuberculosis or are able to resist the activity of the disease exceptionally well. On the other hand, people with diabetes are oversusceptible to tuberculosis.

Curiously enough now the *constitutional* (italics reviewer's) obese have exceptionally high resistance to the pathogenesis of tuberculosis. On the other hand, it has not been noticeable that an *achieved* (italics reviewer's) obesity will arrest an established active tuberculosis.

Although there is an absence of controlled scientific evidence, Krause feels that certain types of thoracic malformation, or deformities which are able to impede or limit respiration, conceivably tip the scales toward active tuberculosis.

Tuberculosis is a self-healing process, and there is complete proof of this experimentally with cattle. In humans all foci of tubercle begin to undergo peripheral fibrosis almost as soon as the tubercle is established. It is interesting to note, too, that within the same body foci in one organ will be healthy as those in another part are exhibiting the signs of floridity.

After a great many experiments made to test the virulence of tubercle bacilli, the observation was made that the tubercle bacillus is a germ of remarkably uniform virulence and one that remains extraordinarily even through the many vicissitudes that years of a chronic infection can conceivably engender.

In regard to the dosage of tubercle bacilli and its pathogenesis, there is much in favor of the general proposition that the size of "dosage" counts. But after weighing all the facts experimentally and clinically, Krause is strongly of the opinion that "a prolonged and more or less continuous ex-

posure to tuberculosis, with its chance for frequently repeated intakes of bacilli, and especially as intervals between successive infections become shortened, is decidedly more momentous as to pathogenesis than single, casual or occasional contacts, no matter what the dosage.''

The Potentially Tuberculous Child. J. Macdonald. Tubercle, July, 1928, ix, 10.

The open-air school has now become recognized as an essential part of the educational and health activities of England. The type of child who is most suitable for admission to the open-air school is the debilitated, anemic, malnourished child, the child with signs of slight glandular and pulmonary tuberculosis, the nervous and choreic child, and the child suffering from adenoids and bronchial catarrh.

The features of these special schools include fresh air and sunlight, proper and sufficient diet, rest, and medical treatment.

Lately there has been added vocational training; for example, there is a millinery and lingerie class for girls, and a commercial class for shorthand and typewriting for boys.

Tuberculosis and Heredity. Léon Bernard. La Presse Medicale, March 24, 1928.

Bernard goes into the question of tuberculosis and heredity. He believes that there is no direct transmission of tuberculosis, neither is there any satisfactory proof that the newborn has either an additional immunity or predisposition to tuberculosis.

As a result of his investigation of 125 families where tuberculosis was present in the family, he found the infant mortality and tubercular infection of their offspring to be much greater than the infants of 127 control families where no tuberculosis was present.

After reviewing the literature Bernard feels strongly against tuberculosis being hereditary, and feels that infants who have tuberculosis in early life are infected because of contact with some adults, usually their parents, who have tuberculosis.

The International Journal of Orthodontia, Oral Surgery and Radiography

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 3523-25 Pine Blvd., St. Louis, Mo.

Foreign Depots — *Great Britain* — Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

Subscription Rates—Single copies, 75 cents. To anywhere in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $7.00 per year in advance. Under foreign postage, $7.40. Volume begins with January and ends with December of each year.

Remittances—Remittances for subscriptions should be made by check, draft, postoffice or express money order, or registered letter payable to the publishers, The C. V. Mosby Company.

Contributions—The editor will be pleased to consider the publication of original communications of merit on orthodontic and allied subjects, which must be contributed solely to this Journal.

Opinions—Neither the editor nor the publisher hold themselves responsible for the opinions of contributors, nor are they responsible for other than editorial statements.

Reprints—The publishers will communicate with authors regarding reprints upon publication of paper.

Communications—Contributed articles, illustrations, letters, books for review, and all other matter pertaining to the editorial department should be addressed to the Editor, Doctor Martin Dewey, 17 Park Ave., New York City. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 3523-25 Pine Blvd., St. Louis, Mo.

Illustrations—Such halftones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

Advertisements — Objectionable advertisements will not be accepted for publication in this Journal. Forms close first of month preceding date of issue. Advertising rates and sizes on application.

Change of Address—The publishers should be advised of change of subscriber's address about fifteen days before date of issue with both new and old addresses given.

Nonreceipt of Copies—Complaints for nonreceipt of copies or requests for extra numbers must be received on or before the fifteenth of the month of publication; otherwise the supply is apt to be exhausted.

Entered at the Post Office at St. Louis, Mo., as Second-Class Matter.

EDITORIALS

A Proposed Amendment to the California Law to Regulate the Practice of Orthodontia

WE ARE publishing herewith a proposed Amendment to the laws regulating the practice of dentistry in California. We are publishing this Amendment in full because it contains so many things which we believe are not for the interest of the public and profession. The proposed Amendment is as follows:

"An Act to regulate the examination of applicants for licenses and the practice of those licensed to practice orthodontia and to amend Sections 11 and 13 of an Act entitled 'An Act to insure the better Education of Dental Surgeons and to regulate the Practice of Dentistry in the State of California providing penalties for the violation thereof,' approved May 21, 1915, as amended, and to add a new Section 7½ thereto, and to repeal all acts or parts of acts in conflict therewith. The People of the State of California do

enact as follows: Section 1. A new section is hereby added to an Act entitled 'An Act to insure the better education of dental surgeons and to regulate the practice of dentistry in the State of California, providing penalties for the violation thereof,' approved May 21, 1915, as amended, to be numbered Section 7½ and to read as follows:

"Section 7½. Any person over twenty-one (21) years of age shall be eligible to take an examination before the Board of Dental Examiners of California as an orthodontist upon making application therefor. Preliminary to the examination by the Board of Dental Examiners such applicant shall comply with the following requirements.

"1. Such applicant shall pay to the Board a fee of Twenty-five ($25.) dollars which in no case shall be refunded.

"2. Such applicant shall present evidence of graduation with recommendations for admission to college from a high school accredited to the University of California or any other university of equal standing. Or a certificate signed by a state superintendent of public instruction or similar office to the effect that such applicant has had scholastic preparation equivalent in all respects to that demanded for graduation, with recommendations for admission to college from a high school giving a four year course of instruction in the state from which such certificate is issued.

"3. Such applicant shall furnish satisfactory evidence of having been in residence at a college or university and having there completed courses, equivalent in all respects to similar courses of instruction maintained in the University of California, in each of the following subjects: Chemistry, 10 units, Zoology, 8 units, Physics, 8 units, English, 12 units, and Mechanical Drawing, 2 units.

"4. Such applicant shall present satisfactory evidence of having graduated from a legally chartered school, college or University approved by the Board of Dental Examiners of California, offering or maintaining a course of instruction in orthodontia covering at least thirty-four hundred (3400) hours and including the following minimum requirements:

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Dental Anatomy and Comparative Anatomy	6 to 8 per cent
Group 3	
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Group 4	
Dental Pathology, Bacteriology and Rhinology	3 to 4 per cent
Group 5	
Dental Science and Metallurgy	3 to 4 per cent
Group 6	
Art, Roentgenology and Photography	1 to 2 per cent
Group 7	
Orthodontia	53 to 63 per cent
Total number of hours required	3400 hours

"5. Such applicant shall present evidence that he or she is at least twenty-one (21) years of age and of good moral character.

"6. Such applicant shall present evidence that he or she has complied with and fulfilled the education requirements herein provided for an applicant to take an examination as an orthodontist.

"Each applicant for the certificate of scholastic preparation, to be issued by the State Superintendent of Public Instructions as hereinbefore provided shall pay a fee of Ten ($10.00) Dollars, all such fees to be paid into the State Treasury to the credit of the contingent fund of the Superintendent of Public Instruction and applied by him in defraying or in partially defraying the expenses of investigating the qualifications of such applicants.

"The examination to practice orthodontia shall include, written in the English language, questions on the following subjects: Orthodontia, Anatomy, Histology, Embryology, Physiology, Dental Anatomy, Dental Pathology, Metallurgy, Comparative Anatomy. Said written examinations may be supplemented by an oral examination. Demonstrations of the applicant's skill in orthodontia must also be given.

"The examiners in orthodontia shall receive the same compensation as a member of the board and may be removed and the vacancy filled at any time by the Governor.

"Having satisfactorily passed such examination, such person shall obtain a license as an orthodontist from the Board of Dental Examiners and shall be by them registered as such. Such licenses shall remain in force until the following first day of May and thereafter so long as the holder thereof shall comply with the provisions of this section relating to an annual tax but not otherwise, and shall authorize the holder thereof to practice orthodontia, and notwithstanding the payment of such tax, such license may at any time be forfeited or revoked for any violation of provisions of this Act that are applicable to orthodontia.

"Each person successfully passing such examination shall be registered as a licensed orthodontist on the board register as provided in Section 3 of said Act approved May 21, 1915, as amended, except that a separate book shall be kept by the Secretary of the Board for the registration of orthodontists, who shall be granted by the board a license to practice orthodontia in the State of California. When a candidate for a license shall have received a grading of 85 per cent, or above in any given subject he shall be exempt from re-examination on that subject in subsequent examinations before the said Board held at the first or second meeting thereafter. The examiners in orthodontia, appointed by the Governor, or any member of the Board, may inquire of any applicant for examination concerning his character, qualifications or experience, and may take testimony of anyone in respect thereto under oath, which he is hereby empowered to administer. Every person who shall hereafter be licensed to practice orthodontia within the State shall, within six months thereafter, register as provided in Section 8 of said Act approved May 21, 1915, as amended, and any failure, neglect or refusal on the part of any person holding such license to register the same as therein provided shall work a forfeiture of his or her license as therein provided.

Orthodontia shall be held to mean any treatment that has for its object the correction of abnormal positions and relations of the teeth, jaws and arches and the restoration to normal structures and function of such related bones, muscles, and other tissues as are abnormally affected thereby.

"To provide a fund for the enforcement of the provisions of this section, every person holding a license as an orthodontist in this State, without exception, shall pay an annual license tax for the year commencing with the first day of May, next following the issuance of such license and annually thereafter, such payment to be effective shall be made prior to the commencement of the year for which the same accrues and the receipt of the secretary of the Board shall be indispensable evidence that the same has been made. The failure, neglect or refusal of any person who was a regular licensed and registered orthodontist to pay in advance said annual tax of Two ($2.00) Dollars during the time such license remains in force shall *ipso facto* work a forfeiture of such license, and it shall not be restored except upon a written application therefor and the payment to said Board of Twenty-five ($25.00) Dollars, except that such person shall not be required to submit to an examination. Every person licensed to practice as an orthodontist in this State shall comply with all the provisions of Section 8 of this Act, except that a separate book shall be kept by the County Clerk for the registration of orthodontists.

"Nothing in this act contained shall prohibit bona fide students of orthodontia from operating in the clinical departments or laboratories of a reputable school of orthodontia, dental college or university, recognized by the Board of Dental Examiners; or licensed dentists engaged in the practice of dentistry at the time of the passage of this act from practicing orthodontia provided such licensed dentist registers as a licensed orthodontist with the Board of Dental Examiners as provided in Section ———, paragraph ———, of this act, prior to July 1, 1934.

"Section 2. Section 11 of the Act approved May 21, 1915, as amended must be amended to strike out the words 'or correct malimposed positions thereof.'

"Section 3. Section 13 of the Act approved May 21, 1915, as amended, is hereby further amended by inserting the words 'or orthodontists' after the word dentist in Section 13, line 1.

Amendments of the Dental Law:

"Delete orthodontia from dental examinations, Section 7, line 7.

"Amend Section 2, of dental law by adding after the word dentists, line 2, the words 'one of whom shall be a practicing orthodontist.' "

The idea of requiring dentists who are practicing a specialty to take a special examination has been advocated before. A similar bill which attempted to control orthodontists was sponsored in California about two years ago by a certain group and was defeated by the activity of the dental and medical profession. We understand the present Amendment is sponsored by another group who have a special interest in education. We have always had a great respect for the ability and fair judgment of the men interested in the

above bill, but we believe they have become over-enthusiastic regarding the educational value of their school and have overlooked the best interests of the dental profession and the public.

We can see no reason why a dentist should have a special license to practice orthodontia any more than a physician should be required to have a special license to practice rhinology, obstetrics, internal medicine, or surgery. If we begin to require a special license for every man who practices a special line of dentistry, why not require the same of the medical man? If we begin such a plan as requiring each specialty to have a special license, there is no telling where the thing will end. We believe there are already too many regulations which demand a certain type of education, both preliminary and professional, and too many Boards interfering with various professional activities. The proposed Act requires the applicant to have a certain specified preliminary education; it requires him to have completed a course equivalent in all respects to similar courses of instructions maintained in the University of California. It requires him to have graduated from a legally chartered school, college or university, approved by the Dental Board of Examiners of California and said course must cover at least thirty-four hundred hours.

During the past few years other universities have attempted to install long courses in orthodontia. At the present time none of them are satisfactory to the profession, and at least four out of seven that we have knowledge of, have been classed as failures by the profession. The other three have managed to exist although their students have been almost universal in criticising the instructions that were given and have referred to the great amount of time that was wasted. In fact, long time courses in the majority of cases have failed to be satisfactory to the men who have taken them.

We believe that after a man has obtained a license to practice dentistry or medicine, he should be allowed to select his own postgraduate instructions and instructors and not be compelled to accept a course which has been arranged by some university to further the policy of that institution. If we are going to have examinations of dental and medical men who practice a special subject, this examination should be for the purpose of establishing their fitness, regardless of where and how they have obtained the knowledge. Many men are practicing a specialty of dentistry or medicine today who have never had instructions on that subject other than what they have received in the school of experience, and they are rendering a good service to the public. On the other hand, we find some men who have taken instructions in various schools, colleges, hospitals, and clinics and who can pass all types of written examinations, and who have fulfilled even the most exacting university requirements and are still practical failures and a detriment to the profession. No amount of university education will make a practical professional man if he has not the proper disposition, and if the man has the inherent qualifications for a professional man, he does not need all of the "university polish" to be a benefit to the public and his patients.

It seems to us that this Act has not been designed for the benefit of the dental profession or the public, but for the purpose of furthering the interest of a certain educational institution and for the purpose of compelling all men

who are going to practice orthodontia in California to take the course as prescribed by a certain group of men. If the "framers" of this Act are sincere and wish to advance the interest of the public and protect the public from incompetent men, then they will propose an Amendment which will simply provide for an examination of all who wish to practice orthodontia provided they are licensed to practice dentistry in the State of California.

It is a question in our mind whether this Act would stand analysis by the Courts. We believe any dentist in California who has been granted a license to practice dentistry, where orthodontia has been a part of that examination, could continue to practice orthodontia regardless of this Act. Every licensed dentist in California today is a licensed orthodontist, and we can see no way for the Courts to rule otherwise. If the license to practice dentistry is granted after the passing of this Act, the law could be enforced on the man who passed the State Board after the Act was passed.

We believe the proposed Act is a case of class legislation, and if the institution is successful in making the orthodontist conform to its plans, it will probably sponsor other Acts making the specialists in periodontia, radiography, oral surgery and all other branches of dentistry take its special courses of instructions before they will be allowed to practice a particular part of dentistry.

We have always had a great respect for the men who are advocating the passage of the above Act but we believe their enthusiasm has prevailed over their judgment in proposing such an Act. We believe the best interest of the dental profession will be served by defeating the proposed Act to license orthodontists.

ORTHODONTIC NEWS AND NOTES

American Society of Orthodontists

The Twenty-eighth Annual Meeting of the American Society of Orthodontists will be held at Estes Park, Colorado, July 15-19, 1929.—General Chairman, Dr. Henry F. Hoffman, Majestic Building, Denver, Colo.

Southwestern Society of Orthodontists

The Southwestern Society of Orthodontists will hold their annual meeting at Dallas, Texas, January 2, 3, 4, and 5, 1929. A cordial invitation is extended to all orthodontists and members of the dental and medical professions.

Paul G. Spencer, Secretary,
Waco, Texas.

The Eastern Association of Graduates of the Angle School of Orthodontia

The next meeting of the Eastern Association of Graduates of the Angle School of Orthodontia will be held at the Vanderbilt Hotel, New York City, on Monday and Tuesday, January 14 and 15, 1929.

An invitation is extended to those interested in orthodontia.

E. Santley Butler, Secretary,
576 Fifth Avenue, New York City.

Ninth District Dental Society of the State of New York

At the October meeting of the Ninth District Dental Society of New York, the entire general session was given over to a consideration of orthodontic problems of special interest to general practitioners.

The meeting was opened by Dr. L. M. Waugh, who gave a most interesting and instructive talk on "The Orthodontic Duty of the General Practitioner to His Patient."

This talk was followed by four clinics of general interest by Dr. Ashplant, of Newburg, Dr. Squires, of White Plains, Dr. Bedell, of Poughkeepsie, and Dr. Howes, of New Rochelle.

Dr. Ashley E. Howes,
New Rochelle, N. Y.

Southern Society of Orthodontists

The annual meeting of the Southern Society of Orthodontists will be held at Macon, Georgia, January 31, February 1 and 2, 1929. A cordial invitation is extended to members of the profession.—W. B. Childs, President, Macon, Georgia; Dr. Oren A. Oliver, Secretary, 1101 Medical Arts Bldg., Nashville, Tenn.

American Dental Association

The Seventy-first Annual Session of the American Dental Association will be held in Washington, D. C., October 7, 8, 9, 10, and 11, 1929.

Harry B. Pinney, Secretary,
58 East Washington Street,
Chicago, Illinois.

Dental Society of the State of New York

The Dental Society of the State of New York will hold its sixty-first annual meeting at Rochester, New York, on May 15, 16, and 17, 1929.

For information with reference to exhibits, write to E. G. Link, 226 Cutler Building, Rochester, New York; Clinics, John T. McIntee, Chairman, Cutler Building, Rochester, New York; Literary Exercises, etc., A. P. Burkhart, Secretary, 57 East Genesee Street, Auburn, New York.

The Dallas Mid-Winter Dental Clinic

The Dallas Mid-Winter Dental Clinic will be held February 11, 12, 13, 1929, in Dallas. The clinicians for this meeting are Dr. T. W. Maves, of Cleveland, Oral Surgery; Dr. James W. Crawford, of Milwaukee, Prosthetics; Dr. Menifee R. Howard, of Denver, Surgery; also a man of national repute in Orthodontia yet to be selected.

Faculty of Dentistry, University of Toronto

The Faculty of Dentistry of the University of Toronto will give their annual course for dental practitioners in Toronto, beginning December 17. This course is arranged to meet the needs of the dental practitioner and will cover various subjects. Only a nominal fee is charged which has never proved more than barely sufficient to cover the expenses of the course. Detailed information can be had by writing to Walter Seccombe, Dean. University of Toronto, Toronto, Canada.

Notes of Interest

Dr. M. B. Markus announces the removal of his offices to Suite 807, Central Medical Building, Philadelphia, Pa. Practice limited to Orthodontia.

Dr. C. Barton Addie announces the removal of his office to the Central Medical Building, Philadelphia, Pa. Practice limited to Orthodontia.

Dr. Holland Gile announces the opening of his office at Medical Arts Building, 207 Elm Street, Holyoke, Mass. General practice of dentistry, specializing in children's dentistry, including Orthodontia.

Dr. Sidney E. Riesner and Dr. Josephine M. Abelson, formerly associated with Dr. Martin Dewey, announce that their office is now at 120 East 39th Street, New York City. Practice limited to Orthodontia.

Dr. R. H. Rudolph announces the opening of his office at 300 Union Trust Building, Parkersburg, West Virginia. Practice limited to Orthodontia.

Dr. J. B. Goldsmith of 210 West 70th Street, New York City, formerly of Newport, R. I., has opened an office at 812 Far Rockaway Blvd., Far Rockaway, L. I. Practice limited to Orthodontia.

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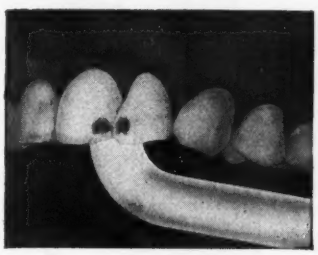

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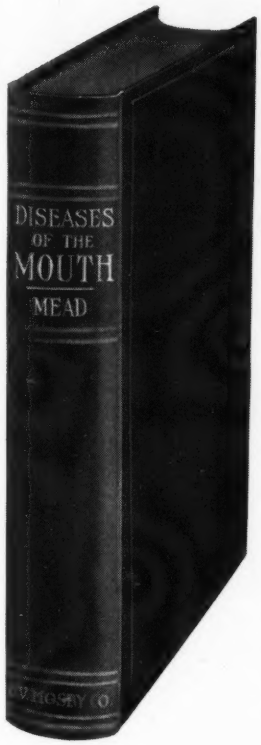

By STERLING V. MEAD, D.D.S.

Professor of Oral Surgery and Diseases of the Mouth, Georgetown Dental School; Professor of Diseases of the Mouth, Georgetown Medical School; Oral Surgeon to Georgetown Hospital; Dental Surgeon to Providence Hospital; Oral Surgeon to Gallinger Municipal Hospital; Consulting Dental Surgeon to Washington Sanitarium and Hospital; Consulting Dental and Oral Surgeon to Shady Rest Sanatorium, Washington, D. C.

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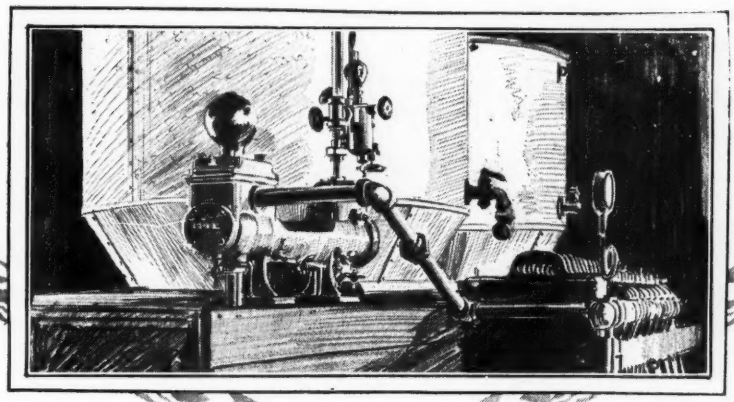

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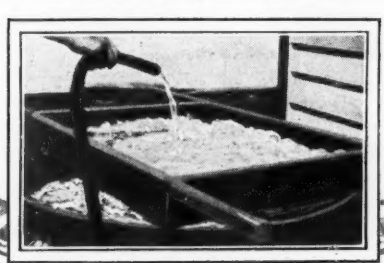
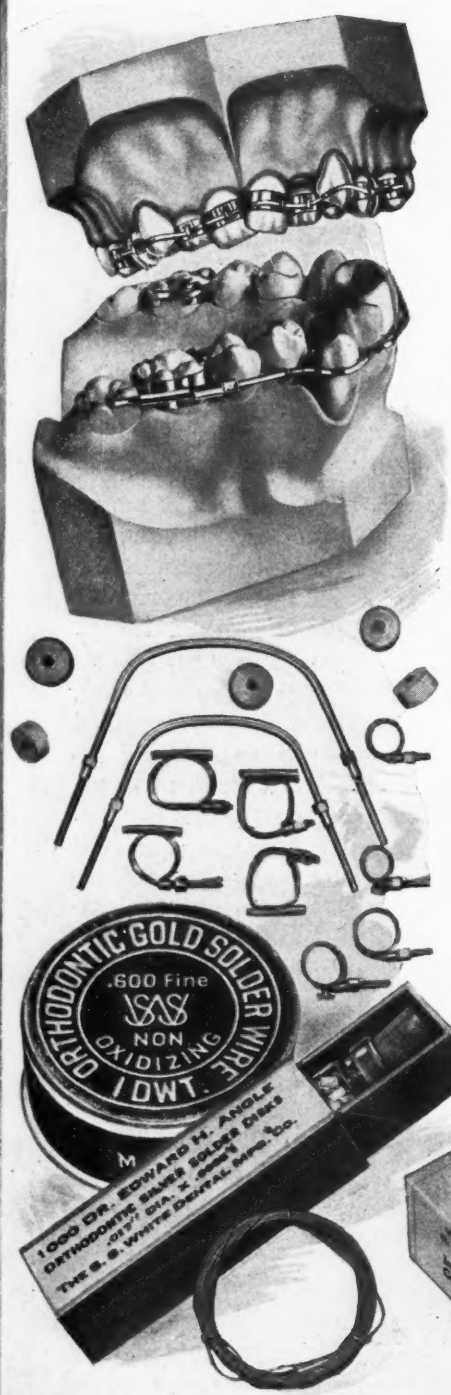
Above Center: Rotting Livers Old Method



At Left: Washing Livers Before Rendering

Samples and Literature on Request

Materials Every Orthodontist



Irrespective of the technique he employs, the orthodontist will find materials, tools, appliances and equipment shown or mentioned on these pages, that by their adaptability to the exacting nature of his work will save his time, help him to achieve his purpose, and make working with them a pleasure. Orthodontia demands perfect tools, materials and appliances. We so make them for every technique.

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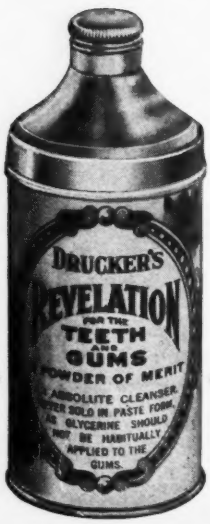

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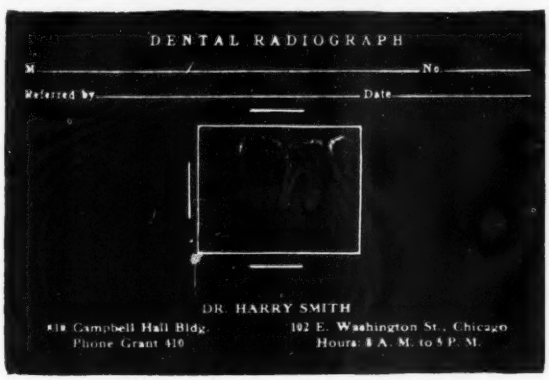

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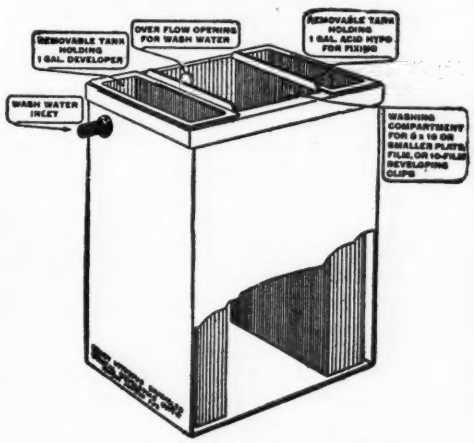
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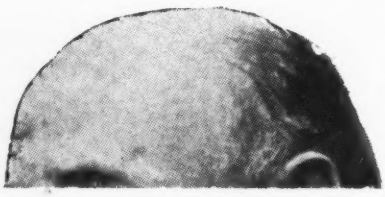

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are so constructed of the best grade of resilient rubber that in use they will extend far under the free gingivae and between the teeth carrying the polishing materials just where they are most needed. The same Polisher may be freed of polishing powder and attached to a Young's Medicator & Masseur and used for forcing medicine into diseased "pockets" as well as for massaging the gums.

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Working temperature between 120° to 130°

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Made in Regular Cakes, Tracing Sticks, and Wafers for your convenience.

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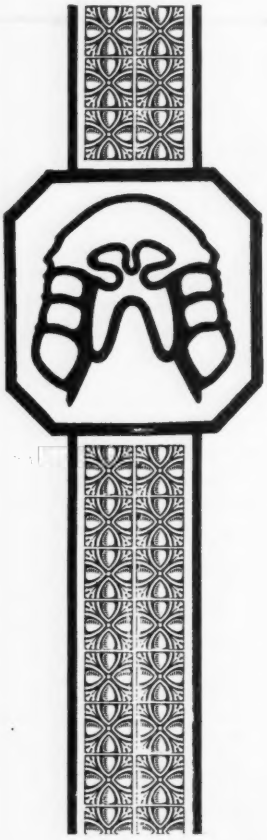

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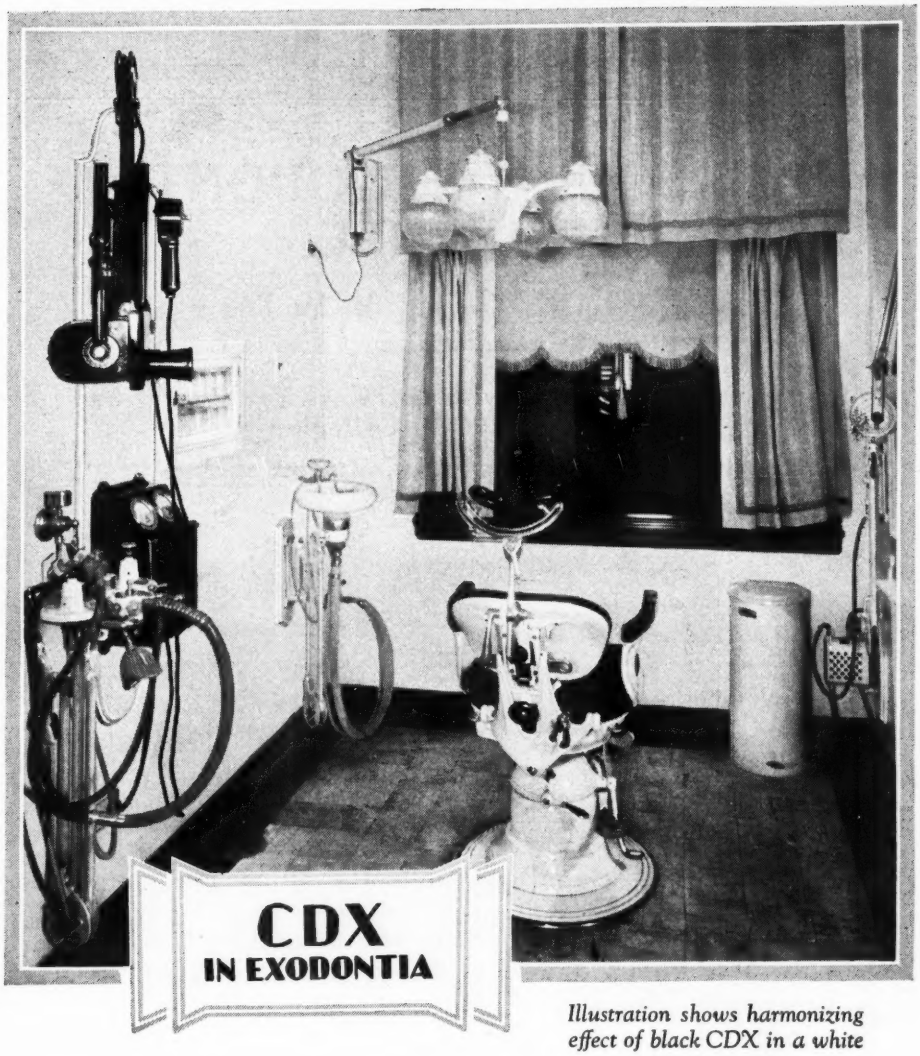

Illustration shows harmonizing effect of black CDX in a white operating room.

HARMONIZES to a nicety in the exodontist's operating room.

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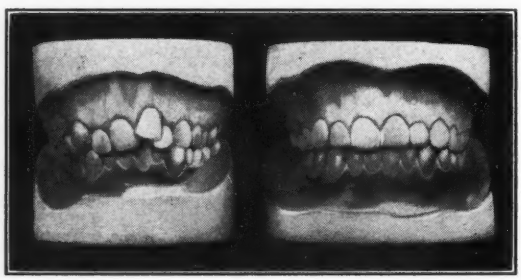
Twenty-three years experience practicing Orthodontia



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"Prompt and Effective Relief"

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Prescribe CIBALGINE, "CIBA" in your next extraction case—both before and after the operation. You will be gratified with the results.

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has definite physical properties

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CONTENTS FOR DECEMBER, 1928

Original Articles

Cast Overlay Technic and Its Application in Practice. By R. C. Willett, D.M.D., Peoria, Ill. ---- 1025

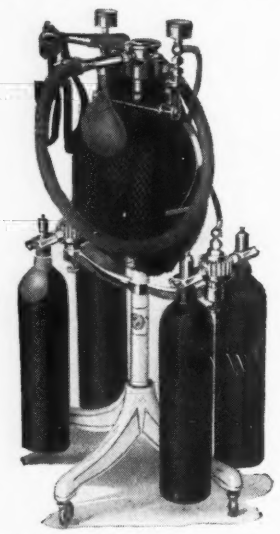
The Physiologic Progress of the Bone Centers of the Hands of Normal Children Between the Ages of Five and Sixteen Inclusive; Also a Comparative Study of Both Retarded and Accelerated Hand Growth in Children Whose General Skeletal Growth is Similarly Affected. By Clinton C. Howard, D.D.S., Atlanta, Georgia ---- 1041

Comments Upon the Relations of the Work of the Orthodontic Specialist to that of the General Medical Practitioner. By Lewellys F. Barker, M.D., Baltimore, Md. ---- 1067

The Use of Coil Springs in Orthodontia (Clinic). By Dr. E. B. Arnold, Houston, Texas ---- 1072

(*Continued on page* 16.)

Why Is Pressure Necessary In Dental Cases?



McKesson Small Tank Dental Unit

The first essential of nitrous oxid-oxygen administration is the *complete exclusion of air.* In the dental case, the mouth is open and even with very excellent well placed mouth packs, air cannot be completely excluded by the pack alone. In addition to the mouth pack, the gases therefore must be administered through the nose and into the respiratory passages, behind the pack, with sufficient *pressure* to keep the air from being drawn through and around the pack.

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CONTENTS FOR DECEMBER, 1928

(*Continued from page* 15.)

Department of Oral Surgery, Oral Pathology and Surgical Orthodontia

Maxillofacial Prosthesis. By Roy L. Bodine, D.D.S., Washington, D. C. ---- 1076

A Practical Consideration of Cyanosis in Anesthesia. By M. Hillel Feldman, D.D.S., New York City---- 1094

Department of Dental and Oral Radiography

A Discussion of the Principles Involved in the Radiographic Study of Facial Deformity. By Dr. Clarence O. Simpson, St. Louis---- 1099

Abstract of Current Literature

Orthodontia, Oral Surgery, Surgical Orthodontia, Dental Radiography, Nutrition and Pediatrics---- 1105

Editorials

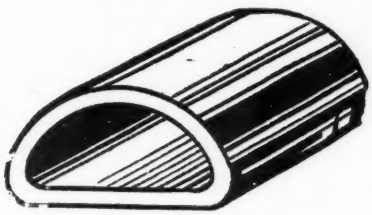
A Proposed Amendment to the California Law to Regulate the Practice of Orthodontia ---- 1110

Orthodontic News and Notes

Orthodontic News and Notes---- 1116

Index ---- 1119

Economy -- Appearance -- Service



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means ease of handling
under any technic you follow.

The rounded corners,
distributing the strain,
increase the life of
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.10 long $3.65 doz.
.09 " 3.55 "
.08 " 3.45 "
3 inches of H.R. shaft to fit—$3.10

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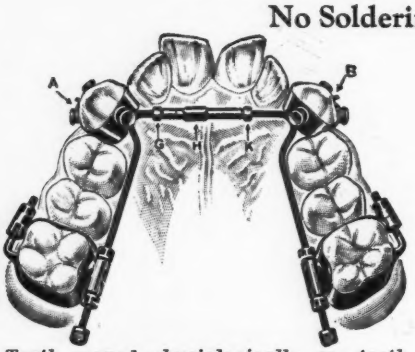
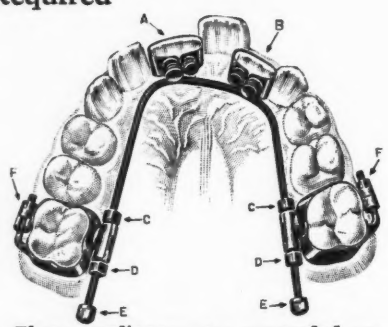
ORTHODONTIC APPLIANCES
Fitted to Models

No Soldering Required



Teeth moved physiologically are teeth moved painlessly.



These appliances are concealed except bands A and B on incisors.

Send Us Your Models for Information and Diagnosis—No Charge

Dr. Knapp's appliances cover the entire orthodontic field and operate in a scientific and practical manner. They are firmly attached to the teeth and all movements may be accurately measured and the appliance locked during the interval between tightening. Tooth movements are, therefore, produced physiologically and without pain or discomfort to the patient.

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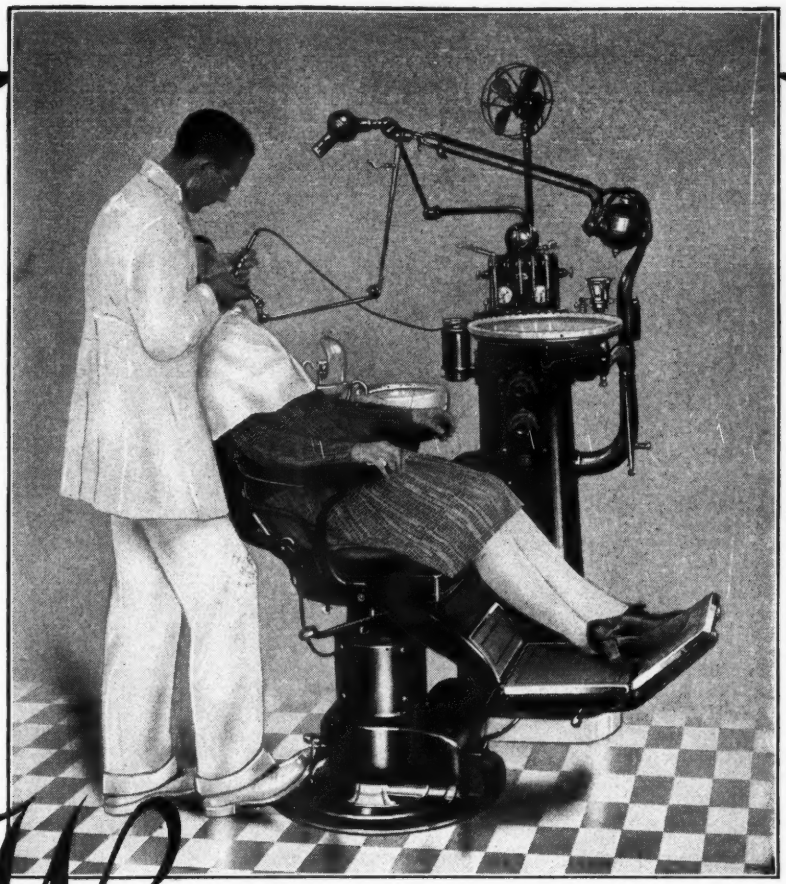

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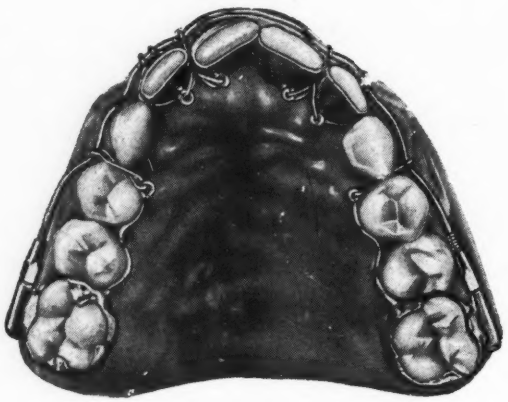

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INDEX TO ADVERTISERS

Please mention "The International Journal of Orthodontia, Oral Surgery and Radiography" when writing to advertisers — It identifies you

Aderer, Julius, Inc. ---------- 21
Antidolor Company ----------Insert
Apollonian, The ---------- 35
Archives of Physical Therapy------- 38

Baker & Co., Inc. ----------Insert
Bacon Manufacturing Co. ---------- 10
Baltimore Hotel, Kansas City, Mo.--- 39
Bernard Hotel, Chicago---------- 39
Blue Island Specialty Co. ------ Insert
Boos, Henry P. ---------- 20
Brady & Company, Geo. W. ------- 7
Bristol-Myers Company ---------- 27

Cameron's Surgical Specialty Co. Insert
Campho-Phenique Company -------- 25
Ciba Company, Inc. ---------- 14
Clean Be-Tween Tooth Brush Co. --- 2
Cook Laboratories, Inc. ----------Insert
Corega Chemical Company--------- 1

Dee & Co., Thomas J. ---Front cover, 17
Dental Book Directory ---------- 40
Dental Echo ---------- 35
Dentists' Supply Company of New York ---------- 28
Detroit Dental Mfg. Co. ---------- 8
Dewey School of Orthodontia------- 45
Drucker Company, August E. ------ 6

Eastman Kodak Company---------- 23

Goldsmith Bros. Smelting & Refining Co. ---------- 15

Hettinger Bros. Mfg. Co. ---------- 30

Imperial Hotel, Detroit---------- 32
Indian Dental Review ---------- 33
International School of Orthodontia- 25

Johnson & Johnson ---------- 18
Journal of the American Dental Hygienists Ass'n ---------- 27

Knapp, Inc., Miland A. ---------- 18

Laryngoscope Co. ---------- 37
Lee House, Washington ---------- 39
Le Monde Dentaire ---------- 32
Linde, John A. ---------- 27

Marvel Pharmacal Company ------- 22
Mead Johnson & Company -------- 3
Medical Protective Company------- 13
Milnesia Laboratories, Inc. -------- 9
Missouri Pacific Lines---------- 33
Moyer Co., J. Bird---------- 22

National Dental Supply Co.--------- 22
Neos Dental Company ---------- 36
Ney Company, The J. M. ----4th cover

Oakland Chemical Company---3rd cover

Patch Company, E. L. ---------- 24

Rapell Dental Laboratories -------- 22
Rare Chemicals, Inc. ---------- 10
Ritter Dental Mfg. Co. ---------- 19

Safety Anesthesia Apparatus Concern ---------- 31
Sharp & Dohme ---------- 7

Thrombley & Son ---------- 12
Toledo Technical Appliance Co.---- 16

V. B. Corporation ---------- 29
Victor X-ray Corporation---------- 11

White Dental Mfg. Co., S. S. ----4, 5
Wilkinson Company ---------- 6
Williams Gold Refining Co. --2nd cover

Young Dental Mfg. Co. ---------- 8

Zeitschrift für Rontgenologie------- 38

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